XV. *Discussion of Tide Observations made at Liverpool. By* John William Lubbock, *Esq. V.P. and Treas. R.S.*

Received and Read June 18, 1835.

By permission of the British Association for the Advancement of Science, I am enabled to present to the Society a discussion by M. Dessiou * of 13,327 observations of the tides made at Liverpool between the 1st of January 1774 and the 31st of December 1792. These observations, which were made by Mr. Hutchinson, Dock-master at that place, belong to the Lyceum at Liverpool, and they were granted with the greatest readiness and liberality by the Committee of that Institution, upon the application of Mr. Whewell and myself, for the purposes of the present inquiry.

Mr. Hutchinson recorded the *solar time* of high water, and the height of the tide in feet and inches, at the Custom-House Dock gates, together with the direction and strength of the wind, and the state of the weather; also, during a great portion of the time, the height of the barometer and thermometer.

The following note is prefixed to the first book of these valuable observations: "These five years' observations upon the tides were made from solar time, and the winds from the true meridian, and their velocity judged according to Mr. Smeaton's rule, our great storms going at the rate of sixty miles an hour; the thermometer kept in-doors, at the head of a staircase four stories high; by William Hutchinson, at the Old Dock gates, Liverpool."

The following note is appended at the conclusion: "These observations, made from the beginning of 1768 to August 10, 1793, make twenty-five years, seven months and ten days, which I have given to our Library, exclusive of the 3000 observations given to Messrs. Holdens, to make their tide tables, as mentioned in their preface to them. I could not continue any longer to make observations, for want of the command of our dock gate men and gauge rod to take the night tides. Having resigned my place as Dockmaster, this journal ceases by me, William Hutchinson."

These notes contain the only information with respect to the manner in which the observations were made which the books afford. The observations appear to have been carefully conducted, but no precautions are stated to have been taken to ensure the accuracy of the time; and it is difficult to fix whether by solar time is meant *apparent* solar or *mean* solar time: this point ought not to have been left in doubt. This point of uncertainty does not however, in any sensible degree, affect the Tables VI., VII., VIII., and IX., which have reference to the variations of the moon's parallax,

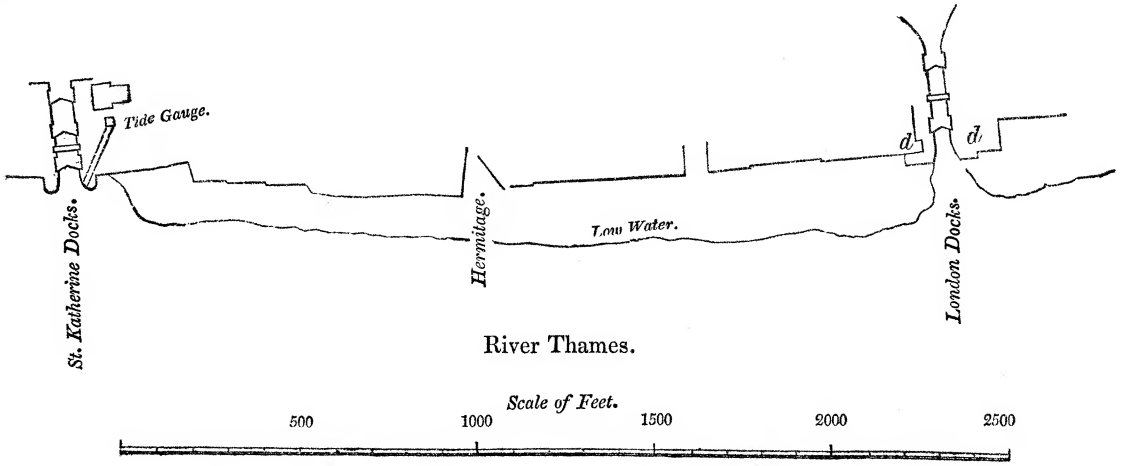
* M. Dessiou has received from the British Association more than £100 for this work.

or those which have reference to the height of high water; but the equation of time is mixed up with the changes in the interval between the moon's transit and the time of high water due to changes in the moon's declination; and any uncertainty with respect to the manner in which the clock has been regulated is therefore much to be regretted.

The plan pursued is the same as that which I adopted with respect to the London Dock observations, and which seems to me to be the only one, in the present state of the subject, which can be resorted to with advantage. If the theory were complete, and the laws or analytical expressions of the phenomena had been made out satisfactorily, it would be possible to proceed at once to determine the constants, which might be done by means of fewer observations, and those might be selected which appeared entitled to the greatest confidence: at present, however, I do not think that this course can be safely pursued.

I trust that this laborious work, which M. Dessiou has accomplished at my instigation, and by the liberal support of the British Association, will not be without utility, and will afford data upon which mathematicians who may hereafter improve the theory of the tides may safely rest their conclusions.

The tides in this port continue to be observed at the London and St. Katherine Docks. These Docks are contiguous, so that the places at which the observations are made are not distant from each other more than 900 yards, as appears from the diagram underneath.



We may therefore, I think, safely conclude, that whatever cause affects the tide at one place will equally affect it at the other; and hence, if we find the difference in the registers of the times and heights of high water much greater than the average difference, suspicion arises that the observation at one or the other place must be erroneous. The observations at the London Docks are made (at the place of the letter *d*) by a person who notes the time when the water has begun to fall, that is, *has made its mark*. Those at the St. Katherine Docks are made by noting upon a slate (ruled for the purpose) the height of the water every minute for a short time

before high water is expected, all which is afterwards copied into a book ruled in the same manner, and the time of high water, with the height, is easily inferred. The height is ascertained by means of a rod or tide-gauge, connected with a float, which is placed in a chamber, into which the water enters through a culvert, so that the ripple or agitation of the water in the river is avoided as much as possible. A clock, carefully regulated, stands close at hand. This plan has been adopted at my suggestion, and, if the observer and the transcriber of the observation do their duty, it does not seem to me to be susceptible of any improvement.

I find by examining the registers of the observations at the London and the St. Katherine Docks, that the tide is on the average about five minutes later there than at the former place, and the difference in height between the lines or zero points, from which the rise is measured, is about five feet. Hence I formed Tables A. and B. by first adding five minutes to the time of high water, and five feet to the height of high water given in the London Dock books, and then comparing the times so altered with those of the St. Katherine Docks. The discrepancies exhibited by these Tables may be attributed to the carelessness of the observers at one or both places, or to the inevitable difficulty of measuring with precision the quantities sought. I next formed Tables C. and D. by adding five minutes to the time of high water given in the St. Katherine Docks register, and five feet to the predicted heights in the British Almanac, in order to compare the observations with the predictions given in the British Almanac, and which are founded upon the Tables, the construction of which I have explained in the Philosophical Transactions, excluding only those observations which, by discordance with the cotemporary observations at the London Docks and with the prediction, appear doubtful. It results from this comparison, that the average error of the predictions of the time of high water contained in the British Almanac is about ten minutes, that is, when the plus and minus errors are not allowed to counteract each other. The average error of Mr. Bulpit's Table is about the same. The tide predictions of Mr. Epps are evidently founded upon the same Tables and the same methods with those in White's Ephemeris, and do not agree quite so well with observation. Those of Mr. Innis are more inaccurate.

When the plus and minus errors are allowed to counteract each other, the average error of the predictions in the British Almanac being, from the observations of the first six months of this year, −9 minutes, leads me to suspect that a change in the establishment has taken place owing to the removal of the old London Bridge. If I am right in this conjecture, it is worthy of remark how sensibly the phenomena of the tides are affected by any slight alteration of local circumstances. Moreover, the height of high water appears to be less by 2 inches than formerly. If the predicted times be increased by 9 minutes and the heights be diminished by 2 inches, the predictions will then agree with observation, nearly as well as the observations at the London and St. Katherine Docks agree with each other.

Table A.

Showing a comparison of the observations of the Times of High Water made at the London Docks, increased by five minutes, and those at the St. Katherine Docks. The observations marked with an * appear doubtful.

Date. 1835.	January.			February.			March.			April.			May.			June.		
	London Docks. +5 min.	St. Kath. Docks.	Difference.	London Docks. +5 min.	St. Kath. Docks.	Difference.	London Docks. +5 min.	St. Kath. Docks.	Difference.	London Docks. +5 min.	St. Kath. Docks.	Difference.	London Docks. +5 min.	St. Kath. Docks.	Difference.	London Docks. +5 min.	St. Kath. Docks.	Difference.
	h m	h m	m	h m	h m	m	h m	h m	m	h m	h m	m	h m	h m	m	h m	h m	m
1.	3 5	3 12	− 7	4 20	4 17	+ 3	3 15	3 6	+ 9	3 50	3 52	− 2	3 55	3 49	+ 6	4 45	4 42	+ 3
	3 35	3 47	−12	4 30	4 47	− 17	3 45	3 45	0	4 15	4 16	− 1	4 10	4 5	+ 5	4 10*	4 53	−43
2.	3 55	3 51	+ 4	4 55	4 57	− 2	3 50	3 41	+ 9	4 25	4 26	− 1	4 20	4 22	− 2	5 25	5 25	0
	4 25	4 32	− 7	5 20	5 28	− 8	4 15	4 22	− 7	4 45	4 42	+ 3	4 35	4 36	− 1	5 35	5 43	− 8
3.	4 45	4 38	+ 7	5 15	5 13	+ 2	4 20	4 24	− 4	4 45	4 44	+ 1	4 50	4 46	+ 4	6 25	6 20	+ 5
	5 10	5 9	+ 1	6 5	6 2	+ 3	4 25	4 28	− 3	5 5	5 3	+ 2	5 0	5 8	− 8	6 35	6 34	+ 1
4.	5 25	5 27	− 2	6 5	6 3	+ 2	4 50	4 51	− 1	5 20	5 18	+ 2	5 35	5 26	+ 9	7 5	7 17	−12
	6 5	5 56	+ 9	6 25	6 27	− 2	5 10	5 16	− 6	5 35	5 41	− 6	5 50	5 47	+ 3	7 25	.....	.....
5.	6 20	5 56	+24	6 45	6 37	+ 8	5 20	5 25	− 5	5 50	5 49	+ 1	6 15	6 6	+ 9	8 20	8 12	+ 8
	6 50	6 45	+ 5	7 15	7 17	− 2	5 35	5 37	− 2	6 10	6 12	− 2	6 35	6 37	− 2	8 55	8 57	− 2
6.	7 5	6 47	+18	7 25	7 23	+ 2	5 45	5 41	+ 4	6 35	6 32	+ 3	7 10	7 17	− 7	9 45	9 43	+ 2
	7 30	7 31	− 1	6 15*	8 6*	−111	6 15	6 16	− 1	7 5	7 2	+ 3	7 45	7 56	−11	10 5	10 6	− 1
7.	7 35	7 22	+13	7 50	7 42	+ 8	6 15	6 16	− 1	7 35	7 31	+ 4	8 25	8 20	+ 5	10 40	10 47	− 7
	8 20	8 12	+ 8	8 35	8 45	− 10	6 45	6 46	− 1	8 5	8 1	+ 4	9 5	9 10	− 5	11 20	11 3	+17
8.	8 20	8 11	+ 9	8 45	9 7	− 22	7 15	7 15	0	8 50	9 1	−11	10 10	10 7	+ 3	11 45	11 49	− 4
	9 10	9 8	+ 2	9 35	9 39	− 4	7 15	7 17	− 2	9 55	9 51	+ 4	10 45	10 44	+ 1	12 5	12 3	+ 2
9.	9 20	9 15	+ 5	10 15*	10 47	− 32	7 50	7 45	+ 5	10 35	10 42	− 7	11 15	11 16	− 1	.....	.....	.....
	10 20	10 22	− 2	9 50*	10 25*	− 35	8 55	9 5	−10	11 25	11 28	− 3	11 45	11 50	− 5	12 45	12 43	+ 2
10.	9 15*	10 17	−62	.....	.....	.....	9 5	9 0	+ 5	11 55	12 8	−13	.....	.....	.....	12 55	12 58	− 3
	11 5	11 9	− 4	12 20*	10 42*	+ 98	9 35	10 0	−25	.....	.....	.....	12 15	12 20	− 5	1 35	1 31	+ 4
11.	11 10	11 21	−11	12 35	12 27	+ 8	10 35	10 55	−20	12 20	12 18	+ 2	12 35	12 38	− 3	1 55	1 49	+ 6
	12 5	12 12	− 7	12 55	12 35	+ 20	12 0	11 58	+ 2	1 5	12 57	+ 8	12 55	1 3	− 8	2 15	2 19	− 4
12.	.....	.....	.....	1 20	1 2	+ 18	12 0	12 6	− 6	1 20	1 12	+ 8	1 20	1 15	+ 5	2 35	2 43	− 8
	12 15	12 22	− 7	1 35	1 43	− 8	.....	.....	.....	1 40	1 44	− 4	1 45	1 52	− 7	3 10	3 7	+ 3
13.	1 5	1 2	+ 3	1 55	2 2	− 7	12 50	12 57	− 7	1 55	1 45	+10	2 5	2 3	+ 3	3 25	3 33	− 8
	1 25	1 22	+ 3	2 30	2 28	+ 2	1 20	1 14	+ 6	2 20	2 25	− 5	2 35	2 43	− 8	3 45	3 51	− 6
14.	1 35	1 37	− 2	2 45	2 44	+ 1	1 45	1 47	− 2	2 40	2 35	+ 5	2 55	2 53	+ 2	4 20	4 18	+ 2
	1 55	2 2	− 7	3 15	3 17	− 2	2 5	2 7	− 2	3 5	3 7	− 2	3 20	3 27	− 7	4 35	4 37	− 2
15.	2 20	2 22	− 2	3 35	3 35	0	2 20	2 23	− 3	3 20	3 23	− 3	3 30	3 37	− 7	5 10	5 13	− 3
	2 35	2 36	− 1	3 50	3 48	+ 2	2 35	2 38	− 3	3 45	3 42	+ 3	4 0	4 2	− 2	5 25	5 23	+ 2
16.	2 55	3 1	− 6	4 0	4 3	− 3	2 55	2 57	− 2	4 5	3 57	+ 8	4 25	4 25	0	5 55	6 2	− 7
	3 0	3 1	− 1	4 25	4 33	− 8	3 25	3 27	− 2	4 25	4 22	+ 3	4 55	4 33	+22	6 10	6 8	+ 2
17.	3 30	3 36	− 6	4 45	4 53	− 8	3 45	3 31	+14	4 45	4 38	+ 7	5 15	5 18	− 3	6 50	6 54	− 4
	3 45	3 53	− 8	5 20	5 18	+ 2	4 5	4 16	−11	5 10	5 7	+ 3	5 35	5 32	+ 3	6 55	6 58	− 3
18.	4 10	4 2	+ 8	5 25	5 25	0	4 25	4 19	+ 6	5 25	5 27	− 2	6 10	6 12	− 2	7 50	7 42	+ 8
	4 40	4 46	− 6	6 0	6 12	− 12	4 50	4 56	− 6	5 50	5 57	− 7	6 20	6 27	− 7	7 55	7 55	0
19.	5 0	4 52	+ 8	6 10	6 7	+ 3	5 15	5 7	+ 8	6 10	6 17	− 7	7 10	7 12	− 2	8 50	8 50	0
	5 30	5 33	− 3	6 35	6 37	− 2	5 35	5 30	+ 5	6 40	6 43	− 3	7 20	7 17	+ 3	9 0	8 56	+ 4
20.	5 50	5 48	+ 2	7 5	6 47	+ 18	5 50	5 41	+ 9	7 25	7 22	+ 3	8 15	8 21	− 6	10 5	9 58	+ 7
	6 10	6 13	− 3	7 30	7 27	+ 3	6 20	6 17	+ 3	7 50	7 50	0	8 40	8 37	+ 3	10 10	10 7	+ 3
21.	6 35	6 33	+ 2	7 45	7 43	+ 2	6 35	6 31	+ 4	8 30	8 37	− 7	9 35	9 33	+ 2	10 40	10 52	−12
	7 10	7 11	− 1	8 25	8 30	− 5	7 5	7 37*	−32	8 55	9 7	−12	9 55	9 47	+ 8	11 5	10 57	+ 8
22.	7 25	7 25	0	8 55	8 52	+ 3	7 25	7 22	+ 3	10 5	10 13	− 8	10 45	10 44	+ 1	11 40	11 52	−12
	7 55	7 57	− 2	9 35	9 28	+ 7	8 10	8 16	− 6	10 30	10 27	+ 3	11 20	10 57	+23	11 55	11 54	+ 1
23.	8 25	8 16	+ 9	10 35	10 35	0	9 10	9 1	+ 9	11 35	11 37	− 2	11 50	11 45	+ 5	.....	.....	.....
	9 5	9 7	− 2	11 5	11 2	+ 3	9 50	9 57	− 7	11 50	11 46	+ 4	11 50	11 59	− 9	12 20	12 22	− 2
24.	9 35	9 29	+ 6	11 25	11 23	+ 2	10 35	10 37	− 2	.....	.....	.....	.....	.....	.....	12 40	12 37	+ 3
	10 10	9 56	+14	.....	.....	.....	11 20	11 22	− 2	12 25	12 26	− 1	12 35	12 36	− 1	1 10	1 3	+ 7
25.	10 35	10 41	− 6	12 15	12 15	0	12 0	12 7	− 7	12 45	12 37	+ 8	12 50	1 16	−26	1 25	1 12	+13
	11 25	11 27	− 2	12 50	12 52	− 2	.....	.....	.....	1 15	.....	.....	1 15	1 33	−18	1 45	1 42	+ 3
26.	.....	.....	.....	1 30	1 33	− 3	12 25	12 27	− 2	1 20	1 17	+ 3	1 20	1 12	+ 8	2 5	2 0	+ 5
	12 10	11 57	+13	1 35	1 32	+ 3	12 55	1 3	− 8	1 45	1 53	− 8	1 45	1 44	+ 1	2 20	2 15	+ 5
27.	12 45	12 42	+ 3	1 50	1 52	− 2	1 10	1 4	+ 6	1 55	1 54	+ 1	1 50	1 53	- 3	2 35	2 35	0
	1 5	1 7	− 2	2 25	2 28	− 3	1 45	1 47	− 2	2 15	2 22	− 7	2 15	2 17	− 2	2 55	2 53	+ 2
28.	1 40	1 31	+ 9	2 35	2 30	+ 5	2 10	1 52	+18	2 35	2 37	− 2	2 25	2 28	− 3	3 5	3 13	− 8
	2 0	2 10	−10	3 0	3 6	− 6	2 25	2 28	− 3	2 50	2 53	− 3	2 50	2 53	− 3	3 35	3 37	− 2
29.	2 25	2 25	0	.....	.....	.....	2 30	2 27	+ 3	3 5	3 8	− 3	3 5	3 4	+ 1	3 55	3 57	− 2
	2 45	2 47	− 2	.....	.....	.....	2 50	2 58	− 8	3 25	3 32	− 7	3 25	3 28	− 3	4 10	4 13	− 3
30.	3 10	3 2	+ 8	.....	.....	.....	3 5	3 3	+ 2	3 30	3 26	+ 4	3 35	3 37	− 2	4 40	4 42	− 2
	3 25	3 32	− 7	.....	.....	.....	3 20	3 22	− 2	3 40	3 35	+ 5	3 55	3 58	− 3	4 55	4 57	− 2
31.	3 45	3 44	+ 1	... ...	.....	.....	3 25	3 28	− 3	.....	.....	.....	4 15	4 12	+ 3	.....	.....	.....
	4 5	4 13	− 8	... ...	.....	.....	3 40	3 48	− 8	.....	.....	.....	4 25	4 23	+ 2	.....	.....	.....

Table B.

Showing a comparison of the observations of the Heights of High Water made at the London Docks, increased by five feet, and those at the St. Katherine Docks. The observations marked with an * appear doubtful.

Date. 1835.	January.			February.			March.			April.			May.			June.		
	London Docks. + 5 ft.	St. Kath. Docks.	Difference.	London Docks. + 5 ft.	St. Kath. Docks.	Difference.	London Docks. + 5 ft.	St. Kath. Docks.	Difference.	London Docks. + 5 ft.	St. Kath. Docks.	Difference.	London Docks. + 5 ft.	St. Kath. Docks.	Difference.	London Docks. + 5 ft.	St. Kath. Docks.	Difference.
	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in
1.	28 0	28 0	0	27 0	27 0	0	27 11	27 9	+ 2	26 9	26 10	− 1	27 4	27 2	+ 2	26 6	26 6	0
	29 6	29 6	0	26 4	26 3	+ 1	27 8	27 8	0	26 7	26 7	0	27 0	26 11	+ 1	25 10	25 10	0
2.	27 4	27 3	+ 1	25 10	25 11	− 1	28 4	28 2	+ 2	26 3	26 3	0	27 0	27 0	0	26 0	25 7	+ 5
	27 2	27 3	− 1	26 11	26 11	0	26 0	25 10	+ 2	26 9	26 3	+ 6	26 10	26 9	+ 1	25 5	25 4	+ 1
3.	26 9	26 9	0	26 8	26 8	0	27 0	26 11	+ 1	27 4	27 3	+ 1	26 9	26 8	+ 1	25 7	25 8	− 1
	26 11	26 10	+ 1	26 11	26 11	0	26 11	26 11	0	26 5	26 5	0	26 1	26 1	0	24 10	24 9	+ 1
4.	26 3	26 2	+ 1	25 9	25 10	− 1	29 1	29 1	0	26 6	26 4	+ 2	25 11	25 9	+ 2	25 5	25 4	+ 1
	26 0	26 0	0	25 11	25 11	0	25 7	25 6	+ 1	25 8	25 8	0	25 1	25 11	−10	24 6	.....	.....
5.	25 10	25 10	0	24 0	24 5	− 5	26 8	26 7	+ 1	25 7	25 7	0	25 3	25 3	0	25 4	23 0*	+28
	25 6	25 10	− 4	23 2*	23 1*	+ 1	26 3	26 4	− 1	24 7	24 4	+ 3	23 3	23 5	− 2	24 5	24 4	+ 1
6.	24 6	24 4	+ 2	24 8	24 9	− 1	22 5	22 3	+ 2	23 11	23 11	0	23 8	23 8	0	25 7	25 7	0
	24 7	24 8	− 1	24 6	24 6	0	25 3	25 3	0	23 3	23 3	0	23 6	23 6	0	25 0	25 1	− 1
7.	24 2	24 2	0	21 2	21 1	+ 1	24 5	24 4	+ 1	23 6	26 4*	−34	24 3	24 2	+ 1	26 0	26 2	− 2
	24 4	24 5	− 1	22 10	22 9	+ 1	22 8	22 7	+ 1	22 8	23 4	− 8	23 11	23 9	+ 2	25 10	25 11	− 1
8.	23 9	25 10*	−25	24 3	24 4	− 1	24 3	24 4	− 1	23 4	23 3	+ 1	24 10	24 10	0	27 0	26 11	+ 1
	23 7	23 8	− 1	23 0	23 0	0	23 2	23 2	0	23 8	23 8	0	24 7	24 9	− 2	26 10	26 6	+ 4
9.	22 6	22 6	0	25 1	25 1	0	21 9	21 7	+ 2	23 11	23 10	+ 1	25 11	26 0	− 1	.....	.....	.....
	23 2	23 1	+ 1	21 5	21 0	+ 5	21 4	21 3	+ 1	24 9	24 9	0	25 6	25 5	+ 1	27 4	27 4	0
10.	25 9	25 8	+ 1	.....	.....	.....	22 0	21 9	+ 3	27 3	27 4	− 1	.....	.....	.....	27 5	27 6	− 1
	23 10	23 10	0	25 0	25 1	− 1	23 7	23 6	+ 1	.....	.....	.....	26 8	26 8	0	27 10	27 11	− 1
11.	24 6	24 5	+ 1	23 7*	25 0	−17	21 2	21 1	+ 1	25 10	26 0	− 2	27 0	26 9	+ 3	28 0	27 10	+ 2
	25 3	25 3	0	24 2	23 8	+ 6	24 10	24 10	0	27 11	28 0	− 1	27 10	28 0	− 2	28 0	28 0	0
12.	.....	.....	.....	24 3*	25 3	−12	25 7	25 8	− 1	26 8	26 7	+ 1	27 4	27 4	0	28 2	28 2	0
	25 4	25 3	+ 1	27 7	27 7	0	.....	.....	.....	27 8	27 7	+ 1	28 5	28 6	− 1	28 1	28 0	+ 1
13.	24 6	24 7	− 1	26 3	26 8	− 5	26 8	26 8	0	27 5	27 1	+ 4	29 0	28 10	+ 2	28 4	28 4	0
	25 5	25 5	0	27 3	27 3	0	27 10	27 10	0	28 7	28 8	− 1	28 8	28 3	+ 5	27 11	27 10	+ 1
14.	26 3	26 3	0	27 6	27 7	− 1	26 8	26 9	− 1	28 3	28 3	0	30 2	30 3	− 1	28 2	28 2	0
	27 0	27 0	0	27 2	27 1	+ 1	26 3	26 3	0	28 9	28 9	0	29 10	29 10	0	27 3	27 3	0
15.	27 4	27 4	0	27 8	27 3	+ 5	28 3	28 4	− 1	29 1	29 1	0	29 6	29 6	0	27 6	27 7	− 1
	26 11	26 10	+ 1	27 7	27 7	0	28 11	29 0	− 1	29 9	29 8	+ 1	28 9	28 10	− 1	27 4	27 1	+ 3
16.	27 8	27 7	+ 1	27 4	27 4	0	28 5	28 6	− 1	29 11	29 10	+ 1	28 6	28 7	− 1	27 0	26 11	+ 1
	25 6	25 3	+ 3	28 3	27 4	+11	29 1	29 0	+ 1	29 0	29 1	− 1	27 3	28 1	−10	26 3	26 1	+ 2
17.	27 11	28 0	− 1	27 7	27 7	0	28 9	28 9	0	28 10	28 10	0	27 2	27 8	− 6	26 4	26 5	− 1
	28 3	28 0	+ 3	27 9	27 10	− 1	29 0	29 1	− 1	28 0	28 0	0	26 4	26 4	0	25 6	25 6	0
18.	27 11	27 10	+ 1	27 3	27 2	+ 1	29 0	29 0	0	27 4	27 5	− 1	26 11	27 0	− 1	25 4	25 3	+ 1
	27 3	27 4	− 1	25 8	25 7	+ 1	29 1	29 2	- 1	26 1	26 0	+ 1	26 0	25 11	+ 1	24 8	24 2	+ 6
19.	27 7	27 3	+ 4	27 4	27 4	0	28 4	28 4	0	25 7	27 6*	−23	26 1	26 0	+ 1	26 0*	23 11	+25
	27 5	27 6	− 1	25 10	25 9	+ 1	27 7	27 6	+ 1	25 1	25 1	0	24 6	24 5	+ 1	24 7	24 7	0
20.	29 0*	26 11	+25	24 3	24 4	− 1	27 7	27 7	0	25 0	25 1	− 1	25 3	25 2	+ 1	24 0	24 0	0
	27 9	27 6	+ 3	25 11	25 11	0	26 8	26 6	+ 2	24 2	24 1	+ 1	24 3	24 0	+ 3	24 9	24 8	+ 1
21.	25 5	25 5	0	26 0	26 1	− 1	26 7	26 6	+ 1	24 6	24 6	0	24 11	24 10	+ 1	25 0	24 11	+ 1
	25 6	25 7	− 1	25 3	25 3	0	25 7	25 7	0	23 3	23 2	+ 1	24 3	24 3	0	24 0	24 2	− 2
22.	25 10	26 0	− 2	25 0	24 11	+ 1	25 6	25 6	0	25 2	25 1	+ 1	25 1	25 0	+ 1	25 3	25 2	+ 1
	25 9	25 10	− 1	24 1	24 1	0	25 2	25 3	− 1	23 10	23 10	0	24 6	24 7	− 1	24 3*	26 1	−22
23.	24 10	25 0	− 2	20 10*	26 10	−72	24 2	24 4	− 2	23 8*	24 8	−12	25 8	25 9	− 1	.....	.....	.....
	25 2	25 3	− 1	25 4	25 3	+ 1	23 8	23 7	+ 1	24 10	24 9	+ 1	25 3	25 1	+ 2	26 3	26 2	+ 1
24.	24 3	24 5	− 2	26 2	26 2	0	25 0	25 1	− 1	.....	.....	.....	.....	.....	.....	25 10	25 11	− 1
	26 6	26 6	0	.....	.....	.....	23 9	23 9	0	25 9	25 10	− 1	26 3	26 2	+ 1	26 0	25 11	+ 1
25.	23 11	23 11	0	25 3	25 4	− 1	25 4	25 4	0	25 1	25 1	0	25 0	25 11	−11	24 0	23 9	+ 3
	26 2	26 3	− 1	24 3	24 3	0	.....	.....	.....	26 6	.....	.....	25 10	25 8	+ 2	25 6	25 6	0
26.	.....	.....	.....	25 11	24 11	+12	24 6	24 6	0	25 7	25 7	0	25 6	26 6	−12	28 0	27 10	+ 2
	25 4	25 4	0	26 7	27 7	−12	25 11	26 0	− 1	27 0	27 4	− 4	26 9	26 9	0	26 10	26 10	0
27.	26 3	26 4	− 1	26 3	26 3	0	26 3	26 3	0	26 6	26 5	+ 1	27 0	26 10	+ 2	28 6	28 6	0
	26 7	26 8	− 1	26 6	26 7	− 1	27 0	26 11	+ 1	26 8	26 8	0	27 5	27 6	− 1	26 9	27 9	−12
28.	26 7	26 7	0	26 11	26 9	+ 2	27 3	26 6	+ 9	26 7	26 7	0	27 3	27 2	+ 1	27 5	27 3	+ 2
	26 9	26 8	+ 1	28 8	28 9	− 1	27 0	27 2	− 2	27 3	27 2	+ 1	27 3	27 4	− 1	27 1	27 0	+ 1
29.	26 11	26 11	0	.....	.....	.....	27 1	27 0	+ 1	28 0	27 11	+ 1	27 3	27 3	0	27 2	27 1	+ 1
	27 8	27 9	− 1	.....	.....	.....	27 1	27 1	0	28 10	28 11	− 1	27 8	27 7	+ 1	26 9	26 10	− 1
30.	27 3	27 3	0	.....	.....	.....	27 0	27 0	0	28 1	28 1	0	27 4	27 4	0	26 8	26 8	0
	27 10	27 10	0	.....	.....	.....	27 6	27 6	0	27 4	27 5	− 1	27 1	27 1	0	26 6	26 7	− 1
31.	27 1	27 1	0	.....	.....	.....	27 3	27 8	− 5	.....	.....	.....	26 9	26 8	+ 1	.....	.....	.....
	27 6	27 4	+ 2	.....	.....	.....	27 5	27 5	0	.....	.....	.....	26 3	26 3	0	.....	.....	.....

Table C.

Showing a comparison of the observed Times of High Water at the St. Katherine Docks, increased by five minutes, with the predicted Times given in the British Almanac. The observations marked with an * appear doubtful.

Date. 1835.	January.			February.			March.			April.			May.			June.		
	British Alman.	St.Kath. Docks. +5 min.	Error of Prediction.	British Alman.	St.Kath. Docks. +5 min.	Error of Prediction.	British Alman.	St.Kath. Docks. +5 min.	Error of Prediction.	British Alman.	St.Kath. Docks. +5 min.	Error of Prediction.	British Alman.	St.Kath. Docks. +5 min.	Error of Prediction.	British Alman.	St.Kath. Docks. +5 min.	Error of Prediction.
	h m	h m	m	h m	h m	m	h m	h m	m	h m	h m	m	h m	h m	m	h m	h m	m
1.	3 14	3 17	− 3	4 20	4 22	− 2	3 24	3 11	+13	3 56	3 57	− 1	3 55	3 54	+ 1	4 41	4 47	− 6
	3 33	3 52	−19	4 38	4 52	−14	3 42	3 50	− 8	4 11	4 21	−10	4 11	4 10	+ 1	5 1	4 58	+ 3
2.	3 56	3 56	0	4 55	5 2	− 7	3 58	3 46	+12	4 23	4 31	− 8	4 25	4 27	− 2	5 22	5 30	− 8
	4 20	4 37	−17	5 12	5 33	−21	4 11	4 27	−16	4 36	4 47	−11	4 40	4 41	− 1	5 46	5 48	− 2
3.	4 40	4 43	− 3	5 30	5 18	+12	4 26	4 29	− 3	4 50	4 49	+ 1	4 56	4 51	+ 5	6 13	6 25	−12
	5 1	5 14	−13	5 45	6 7	−22	4 41	4 33	+ 8	5 3	5 8	− 5	5 14	5 13	+ 1	6 40	6 39	+ 1
4.	5 20	5 32	−12	6 2	6 8	− 6	4 56	4 56	0	5 20	5 23	− 3	5 33	5 31	+ 2	7 6	7 22	−16
	5 43	6 1	−18	6 20	6 32	−12	5 9	5 21	−12	5 37	5 46	− 9	5 55	5 52	+ 3	7 39	.....	.....
5.	6 2	6 1	+ 1	6 36	6 42	− 6	5 25	5 30	− 5	5 56	5 54	+ 2	6 20	6 11	+ 9	8 14	8 17	− 3
	6 25	6 50	−25	6 55	7 22	−27	5 42	5 42	0	6 14	6 17	− 3	6 46	6 42	+ 4	8 51	9 2	−11
6.	6 47	6 52	− 5	7 14	7 28	−14	5 58	5 46	+12	6 36	6 37	− 1	7 18	7 22	− 4	9 27	9 48	−21
	7 11	7 36	−25	7 35	8 11*		6 13	6 21	− 8	7 4	7 7	− 3	7 55	8 1	− 6	9 59	10 11	−12
7.	7 34	7 27	+ 7	8 0	7 47	+13	6 32	6 21	+11	7 33	7 36	− 3	8 36	8 25	+11	10 30	10 52	−22
	7 55	8 17	−22	8 25	8 50	−25	6 50	6 51	− 1	8 14	8 6	+ 8	9 18	9 15	+ 3	11 3	11 8	− 5
8.	8 18	8 16	+ 2	9 3	9 12	− 9	7 10	7 20	−10	9 0	9 6	− 6	9 59	10 12	−13	11 34	11 54	−20
	8 46	9 13	−27	9 39	9 44	− 5	7 36	7 22	+14	9 45	9 56	−11	10 40	10 49	− 9	12 4	12 8	− 4
9.	9 15	9 20	− 5	10 17	10 52	−35	8 4	7 50	+14	10 30	10 47	−17	11 15	11 21	− 6	.....	.....	.....
	9 46	10 27	−41	11 1	10 30*		8 49	9 10	−21	11 12	11 33	−21	11 48	11 55	− 7	12 31	12 48	−17
10.	10 19	10 22	− 3	.....	.....	.....	9 32	9 5	+27	11 45	12 13	−28	.....	.....	.....	12 57	1 3	− 6
	10 53	11 14	−21	11 36	10 47*		10 20	10 5	+15	.....	.....	.....	12 15	12 25	−10	1 21	1 36	−15
11.	11 24	11 26	− 2	12 8	12 32	−24	11 4	11 0	+ 4	12 15	12 23	− 8	12 37	12 43	− 6	1 46	1 54	− 8
	11 50	12 17	−27	12 28	12 40	−12	11 39	12 3	−24	12 43	1 2	−19	12 59	1 8	− 9	2 10	2 24	−14
12.	.....	.....	.....	1 8	1 7	+ 1	12 4	12 11	− 7	1 10	1 17	− 7	1 20	1 20	0	2 36	2 48	−12
	12 18	12 27	− 9	1 33	1 48	−15	.....	.....	.....	1 35	1 49	−14	1 43	1 57	−14	3 2	3 12	−10
13.	12 42	1 7	−25	1 56	2 7	−11	12 43	1 2	−19	1 53	1 50	+ 3	2 5	2 8	− 3	3 27	3 38	−11
	1 6	1 27	−21	2 21	2 33	−12	1 11	1 19	− 8	2 11	2 30	−19	2 27	2 48	−21	3 53	3 56	− 3
14.	1 29	1 42	−13	2 41	2 49	− 8	1 34	1 52	−18	2 31	2 40	− 9	2 51	2 58	− 7	4 19	4 23	− 4
	1 52	2 7	−15	3 1	3 22	−21	1 57	2 12	−15	2 53	3 12	−19	3 13	3 32	−19	4 37	4 42	− 5
15.	2 13	2 27	−14	3 21	3 40	−19	2 18	2 28	−10	3 16	3 28	−12	3 37	3 42	− 5	5 0	5 18	−18
	2 33	2 41	− 8	3 40	3 53	−13	2 38	2 43	− 5	3 38	3 47	− 9	4 1	4 7	− 6	5 23	5 28	− 5
16.	2 54	3 6	−12	4 0	4 8	− 8	3 0	3 2	− 2	3 58	4 2	− 4	4 24	4 30	− 6	5 44	6 7	−23
	3 9	3 6	+ 3	4 22	4 38	−16	3 20	3 32	−12	4 20	4 27	− 7	4 46	4 38	+ 8	6 9	6 13	− 4
17.	3 33	3 41	− 8	4 41	4 58	−17	3 39	3 36	+ 3	4 39	4 43	− 4	5 11	5 23	−12	6 36	6 59	−23
	3 53	3 58	− 5	5 1	5 23	−22	3 58	4 21	−23	5 1	5 12	−11	5 36	5 37	− 1	7 3	7 3	0
18.	4 16	4 7	+ 9	5 24	5 30	− 6	4 20	4 24	− 4	5 22	5 32	−10	6 2	6 17	−15	7 28	7 47	−19
	4 38	4 51	−13	5 46	6 17	−31	4 39	5 1	−22	5 46	6 2	−16	6 27	6 32	− 5	8 1	8 0	+ 1
19.	5 1	4 57	+ 4	6 7	6 12	− 5	5 0	5 12	−12	6 8	6 22	−14	6 55	7 17	−22	8 32	8 55	−23
	5 24	5 38	−14	6 30	6 42	−12	5 22	5 35	−13	6 35	6 48	−13	7 28	7 22	+ 6	9 1	9 1	0
20.	5 51	5 53	− 2	6 53	6 52	+ 1	5 44	5 46	− 2	7 4	7 27	−23	8 1	8 26	−25	9 31	10 3	−32
	6 17	6 18	− 1	7 15	7 32	−17	6 5	6 22	−17	7 38	7 55	−17	8 41	8 42	− 1	10 1	10 12	−11
21.	6 39	6 38	+ 1	7 40	7 48	− 8	6 28	6 36	− 8	8 25	8 42	−17	9 20	9 38	−18	10 30	10 57	−27
	7 1	7 16	−15	8 13	8 35	−22	6 52	7 42*		9 12	9 12	0	9 59	9 52	+ 7	11 0	11 2	− 2
22.	7 25	7 30	− 5	8 54	8 57	− 3	7 19	7 27	− 8	9 58	10 18	−20	10 38	10 49	−11	11 31	11 57	−26
	7 48	8 2	−14	9 41	9 33	+ 8	7 52	8 21	−29	10 42	10 32	+10	11 15	11 2	+13	11 56	11 59	− 3
23.	8 18	8 21	− 3	10 28	10 40	−12	8 39	9 6	−27	11 21	11 42	−21	11 44	11 50	− 6	.....	.....	.....
	8 49	9 12	−23	11 11	11 7	+ 4	9 27	10 2	−35	11 55	11 51	+ 4	12 6	12 4	+ 2	12 18	12 27	− 9
24.	9 23	9 34	−11	11 50	11 28	+22	10 17	10 42	−25	.....	.....	.....	.....	.....	.....	12 41	12 42	− 1
	10 1	10 1	0	.....	.....	.....	11 5	11 27	−22	12 22	12 31	− 9	12 25	12 41	−16	1 3	1 8	− 5
25.	10 43	10 46	− 3	12 25	12 20	+ 5	11 45	12 12	−27	12 46	12 42	+ 4	12 44	1 21	−37	1 23	1 17	+ 6
	11 21	11 32	−11	12 57	12 57	0	.....	.....	.....	1 8	.....	.....	1 1	1 38	−37	1 42	1 47	− 5
26.	.....	.....	.....	1 25	1 38	−13	12 16	12 32	−16	1 28	1 22	+ 6	1 20	1 17	+ 3	2 0	2 5	− 5
	11 58	12 2	− 4	1 52	1 37	+15	12 44	1 8	−24	1 44	1 58	−14	1 37	1 49	−12	2 18	2 20	− 2
27.	12 31	12 47	−16	2 10	1 57	+13	1 10	1 9	+ 1	1 55	1 59	− 4	1 52	1 58	− 6	2 38	2 40	− 2
	1 5	1 12	− 7	2 31	2 33	− 2	1 33	1 52	−19	2 10	2 27	−17	2 8	2 22	−14	2 57	2 58	− 1
28.	1 31	1 36	− 5	2 49	2 35	+14	1 50	1 57	− 7	2 25	2 42	−17	2 23	2 33	−10	3 15	3 18	− 3
	1 58	2 15	−17	3 7	3 11	− 4	2 8	2 33	−25	2 40	2 58	−18	2 40	2 58	−18	3 33	3 42	− 9
29.	2 19	2 30	−11	.....	.....	.....	2 27	2 32	− 5	2 54	3 13	−19	2 57	3 9	−12	3 52	4 2	−10
	2 42	2 52	−10	.....	.....	.....	2 44	3 3	−19	3 8	3 37	−29	3 14	3 33	−19	4 12	4 18	− 6
30.	3 4	3 7	− 3	.....	.....	.....	2 59	3 8	− 9	3 24	3 31	− 7	3 30	3 42	−12	4 32	4 47	−15
	3 25	3 37	−12	.....	.....	.....	3 13	3 27	−14	3 39	3 40	− 1	3 47	4 3	−16	4 53	5 2	− 9
31.	3 43	3 49	− 6	.....	.....	.....	3 27	3 33	− 6	.....	.....	.....	4 7	4 17	−10	.....	.....	.....
	4 2	4 18	−16	.....	.....	.....	3 43	3 53	−10	.....	.....	.....	4 26	4 28	− 2	.....	.....	.....

TABLE D.

Showing a comparison of the observed Heights of High Water at the St. Katherine Docks, with the predicted Heights given in the British Almanac, increased by five feet. The observations marked with an * appear doubtful.

Date.	January.			February.			March.			April.			May.			June.		
1835.	British Alman. + 5 ft.	St. Kath. Docks.	Error of Prediction.	British Alman. + 5 ft.	St. Kath. Docks.	Error of Prediction.	British Alman. + 5 ft.	St. Kath. Docks.	Error of Prediction.	British Alman. + 5 ft.	St. Kath. Docks.	Error of Prediction.	British Alman. + 5 ft.	St. Kath. Docks.	Error of Prediction.	British Alman. + 5 ft.	St. Kath. Docks.	Error of Prediction.
	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.
1.	27 10	28 0	− 2	27 5	27 0	+ 5	27 6	27 9	− 3	27 3	26 10	+ 5	27 2	27 2	0	26 11	26 6	+ 5
	27 9	29 6	−21	27 3	26 3	+12	27 6	27 8	− 2	27 2	26 7	+ 7	27 1	26 11	+ 2	26 9	25 10	+11
2.	27 8	27 3	+ 5	27 1	25 11	+14	27 6	28 2	− 8	27 0	26 3	+ 9	26 11	27 0	− 1	26 4	25 7	+ 9
	27 6	27 3	+ 3	26 10	26 11	− 1	27 5	25 10	+19	26 10	26 3	+ 7	26 9	26 9	0	26 2	25 4	+10
3.	27 3	26 9	+ 6	26 6	26 8	− 2	27 2	26 11	+ 3	26 8	27 3	− 7	26 6	26 8	− 2	25 11	25 8	+ 3
	27 0	26 10	+ 2	26 3	26 11	− 8	27 0	26 11	+ 1	26 6	26 5	+ 1	26 3	26 1	+ 2	25 8	24 9	+11
4.	26 7	26 2	+ 5	25 11	25 9	+ 2	26 10	29 1	−27	26 3	26 4	− 1	26 0	25 9	+ 3	25 5	25 4	+ 1
	26 2	26 0	+ 2	25 7	25 11	− 4	26 8	25 6	+14	25 11	25 8	+ 3	25 8	25 11	− 3	25 2	.....	.....
5.	25 11	25 10	+ 1	25 4	24 5	+11	26 5	26 7	− 2	25 7	25 7	0	25 4	25 3	+ 1	25 2	23 0*	
	25 7	25 10	− 3	25 1	23 1*		26 2	26 4	− 2	25 3	24 4	+11	25 0	23 5	+19	25 3	24 4	+11
6.	25 3	24 4	+11	24 9	24 9	0	25 10	22 3	+43	24 11	23 11	+12	24 9	23 8	+13	25 5	25 7	− 2
	25 0	24 8	+ 4	24 5	24 6	− 1	25 5	25 3	+ 2	24 7	23 3	+16	24 8	23 6	+14	25 8	25 1	+ 7
7.	24 8	24 2	+ 6	24 2	21 1	+37	25 3	24 4	+11	24 4	26 4*		24 8	24 2	+ 6	25 10	26 2	− 4
	24 5	24 5	0	23 11	22 9	+14	24 11	22 7	+28	24 3	23 4	+11	24 10	23 9	+13	26 1	25 11	+ 2
8.	24 2	25 10*		23 10	24 4	− 6	24 7	24 4	+ 3	24 3	23 3	+12	25 3	24 10	+ 5	26 5	26 11	− 6
	24 0	23 8	+ 4	23 10	23 0	+10	24 3	23 2	+13	24 7	23 8	+11	25 9	24 9	+12	26 9	26 6	+ 3
9.	23 11	22 6	+17	24 1	25 1	−12	24 1	21 7	+30	25 1	23 10	+15	26 3	26 0	+ 3	.....	.....	.....
	23 11	23 1	+10	24 7	21 0	+43	23 11	21 3	+32	25 8	24 9	+11	26 9	25 5	+16	27 0	27 4	− 4
10.	24 0	25 8	−20	.....	.....	.....	24 1	21 9	+28	26 2	27 4	−14	.....	.....	.....	27 4	27 6	− 2
	24 3	23 10	+ 5	25 1	25 1	0	24 6	23 6	+12	.....	.....	.....	27 0	26 8	+ 4	27 7	27 11	− 4
11.	24 7	24 5	+ 2	25 6	25 0	+ 6	24 11	21 1	+46	26 8	26 0	+ 8	27 4	26 9	+ 7	27 10	27 10	0
	25 1	25 3	− 2	26 0	23 8	+28	25 6	24 10	+ 8	27 2	28 0	−10	27 7	28 0	− 5	28 0	28 0	0
12.	.....	.....	.....	26 7	25 3	+16	26 0	25 8	+ 4	27 8	26 7	+13	27 9	27 4	+ 5	28 1	28 2	− 1
	25 3	25 3	0	27 0	27 7	− 7	.....	.....	.....	27 11	27 7	+ 4	28 0	28 6	− 6	28 2	28 0	+ 2
13.	25 10	24 7	+15	27 5	26 8	+ 9	26 8	26 8	0	28 1	27 1	+12	28 2	28 10	− 8	28 2	28 4	− 2
	26 4	25 5	+11	27 9	27 3	+ 6	27 2	27 10	− 8	28 3	28 8	− 5	28 3	28 3	0	28 1	27 10	+ 3
14.	26 8	26 3	+ 5	27 11	27 7	+ 4	27 6	26 9	+ 9	28 4	28 3	+ 1	28 4	30 3	−23	27 10	28 2	− 4
	27 0	27 0	0	28 1	27 1	+12	27 10	26 3	+19	28 5	28 9	− 4	28 4	29 10	−18	27 7	27 3	+ 4
15.	27 5	27 4	+ 1	28 3	27 3	+12	28 2	28 4	− 2	28 6	29 1	− 7	28 4	29 6	−14	27 2	27 7	− 5
	27 7	26 10	+ 9	28 4	27 7	+ 9	28 4	29 0	− 8	28 6	29 8	−14	28 2	28 10	− 8	26 9	27 1	− 4
16.	27 9	27 7	+ 2	28 5	27 4	+13	28 5	28 6	− 1	28 5	29 10	−17	27 11	28 7	− 8	26 4	26 11	− 7
	27 10	25 3	+31	28 4	27 4	+12	28 6	29 0	− 6	28 3	29 1	−10	27 5	28 1	− 8	25 11	26 1	− 2
17.	28 0	28 0	0	28 2	27 7	+ 7	28 6	28 9	− 3	27 11	28 10	−11	27 0	27 8	− 8	25 6	26 5	−11
	28 0	28 0	0	28 0	27 10	+ 2	28 6	29 1	− 7	27 6	28 0	− 6	26 6	26 4	+ 2	25 1	25 6	− 5
18.	28 0	27 10	+ 2	27 9	27 2	+ 7	28 4	29 0	− 8	27 0	27 5	− 5	26 1	27 0	−11	24 9	25 3	− 6
	27 11	27 4	+ 7	27 5	25 7	+22	28 2	29 2	−12	26 6	26 0	+ 6	25 6	25 11	− 5	24 6	24 2	+ 4
19.	27 9	27 3	+ 6	27 0	27 4	− 4	27 11	28 4	− 5	25 11	27 6*		25 0	26 0	−12	24 3	23 11	+ 4
	27 6	27 6	0	26 7	25 9	+10	27 7	27 6	+ 1	25 3	25 1	+ 2	24 7	24 5	+ 2	24 2	24 7	− 5
20.	27 3	26 11	+ 4	26 0	24 4	+20	27 1	27 7	− 6	24 9	25 1	− 4	24 3	25 2	−11	24 1	24 0	+ 1
	27 0	27 6	− 6	25 5	25 11	− 6	26 6	26 6	0	24 4	24 1	+ 3	24 2	24 0	+ 2	24 1	24 8	− 7
21.	26 8	25 5	+15	25 0	26 1	−11	25 11	26 6	− 7	24 2	24 6	− 4	24 2	24 10	− 8	24 2	24 11	− 9
	26 3	25 7	+ 8	24 7	25 3	− 8	25 4	25 7	− 3	24 1	23 2	+11	24 4	24 3	+ 1	24 4	24 2	+ 2
22.	25 10	26 0	− 2	24 4	24 11	− 7	24 10	25 6	− 8	24 3	25 1	−10	24 7	25 0	− 5	24 7	25 2	− 7
	25 5	25 10	− 5	24 4	24 1	+ 3	24 5	25 3	−10	24 6	23 10	+ 8	24 11	24 7	+ 4	24 10	26 1	−15
23.	25 1	25 0	+ 1	24 7	26 10	−27	24 2	24 4	− 2	24 11	24 8	+ 3	25 1	25 9	− 8	.....	.....	.....
	24 9	25 3	− 6	24 11	25 3	− 4	24 2	23 7	+ 7	25 3	24 9	+ 6	25 3	25 1	+ 2	25 2	26 2	−12
24.	24 8	24 5	+ 3	25 4	26 2	−10	24 5	25 1	− 8	.....	.....	.....	.....	.....	.....	25 5	25 11	− 6
	24 9	26 6	−21	.....	.....	.....	24 9	23 9	+12	25 7	25 10	− 3	25 6	26 2	− 8	25 10	25 11	− 1
25.	25 0	23 11	+13	25 9	25 4	+ 5	25 2	25 4	− 2	25 11	25 1	+10	25 8	25 11	− 3	26 3	23 9	+30
	25 4	26 3	−11	26 3	24 3	+24	.....	.....	.....	26 3	.....	.....	26 0	25 8	+ 4	26 6	25 6	+12
26.	.....	.....	.....	26 7	24 11	+20	25 6	24 6	+12	26 7	25 7	+12	26 3	26 6	− 3	26 10	27 10	−12
	25 9	25 4	+ 5	26 10	27 7	− 9	25 10	26 0	− 2	26 9	27 4	− 7	26 6	26 9	− 3	27 1	26 10	+ 3
27.	26 2	26 4	− 2	26 1	26 3	− 2	26 1	26 3	− 2	26 10	26 5	+ 5	26 8	26 10	− 2	27 4	28 6	−14
	27 7	26 8	+11	27 4	26 7	+ 9	26 7	26 11	− 4	26 11	26 8	+ 3	26 11	27 6	− 7	27 5	27 9	− 4
28.	26 11	26 7	+ 4	27 6	26 9	+ 9	26 10	26 6	+ 4	27 1	26 7	+ 6	27 1	27 2	− 1	27 6	27 3	+ 3
	27 2	26 8	+ 6	27 6	28 9	−15	27 1	27 2	− 1	27 2	27 2	0	27 2	27 4	− 2	27 7	27 0	+ 7
29.	27 5	26 11	+ 6	.....	.....	.....	27 4	27 0	+ 4	27 3	27 11	− 8	27 3	27 3	0	27 6	27 1	+ 5
	27 7	27 9	− 2	.....	.....	.....	27 5	27 1	+ 4	27 3	28 11	−20	27 4	27 7	− 3	27 6	26 10	+ 8
30.	27 8	27 3	+ 5	.....	.....	.....	27 5	27 0	+ 5	27 3	28 1	−10	27 4	27 4	0	27 5	26 8	+ 9
	27 8	27 10	− 2	.....	.....	.....	27 5	27 6	− 1	27 3	27 5	− 2	27 3	27 1	+ 2	27 3	26 7	+ 8
31.	27 7	27 1	+ 6	.....	.....	.....	27 4	27 8	− 4	.....	.....	.....	27 2	26 8	+ 6	.....	.....	.....
	27 6	27 4	+ 2	.....	.....	.....	27 3	27 5	− 2	.....	.....	.....	27 1	26 3	+10	.....	.....	.....

Table I.

Showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Height of High Water at the Liverpool Old Docks (as recorded by Mr. Hutchinson), corresponding to the Apparent Solar Time of the Moon's Transit, in each month of the year. (If Mr. Hutchinson's clock was regulated according to *mean* solar time, the interval must be *diminished* by the equation of time given at foot of each month.)

Number of Observations.	January. Moon's Transit.	Interval.	Height of Tide.	Mean of Moon's Decl.
	h m	h m	ft. in.	°
90	31·2	11 13·3	17 5·6	18
97	1 31·6	10 59·1	17 9·0	15
93	2 31·3	10 46·8	17 6·1	10
103	3 30·1	10 37·1	16 1·0	5
100	4 28·5	10 31·2	15 2·2	5
105	5 30·6	10 33·9	13 8·3	8
96	6 29·7	10 49·2	12 7·3	14
95	7 30·5	11 16·3	12 4·3	19
93	8 30·8	11 38·1	13 6·7	19
84	9 30·6	11 45·1	14 11·5	23
89	10 31·1	11 38·4	16 0·0	22
84	11 31·6	11 34·1	16 8·9	22
Equat. of Time *to be added to app. time...*		+10	...	...

Number of Observations.	February. Moon's Transit.	Interval.	Height of Tide.	Mean of Moon's Decl.
	h m	h m	ft. in.	°
89	31·9	11 17·9	18 0·6	10
92	1 31·4	11 8·0	18 0·5	5
90	2 30·9	10 49·4	17 8·4	5
90	3 29·3	10 37·4	16 8·9	8
92	4 29·1	10 27·3	15 2·5	14
86	5 29·2	10 26·2	13 4·7	18
86	6 29·7	10 37·8	11 11.5	21
84	7 30·8	11 8·3	11 9·3	21
79	8 30·4	11 37·6	12 9·4	23
82	9 29·8	11 51·1	14 5·7	22
79	10 31·1	11 43·8	15 11·6	19
84	11 30·2	11 31·5	17 4·8	15
Equat. of Time *to be added to app. time...*		+15	...	...

Number of Observations.	March. Moon's Transit.	Interval.	Height of Tide.	Mean of Moon's Decl.
	h m	h m	ft. in.	°
105	30·0	11 19·1	18 4·7	5
99	1 30·9	11 3·7	18 5·9	8
101	2 31·9	10 49·0	17 7·3	13
92	3 31·2	10 33·0	16 3·4	16
89	4 30·2	10 20·3	14 5·8	21
89	5 30·4	10 16·2	13 0·0	22
88	6 31·6	10 30·5	11 4·6	22
85	7 30·4	11 5·9	11 3·7	22
94	8 31·0	11 41·3	12 8·5	20
98	9 31·8	11 50·6	14 8·1	15
97	10 31·2	11 44·8	16 6·9	10
92	11 29·7	11 33·5	17 8·1	6
	...	+9	...	...

	April.			
90	29·9	11 19·4	18 0·1	12
91	1 30·5	11 1·0	17 10·6	17
87	2 30·0	10 43·4	17 0·1	20
87	3 30·9	10 30·2	15 11·6	22
87	4 31·0	10 14·0	14 5·1	23
85	5 30·7	10 12·9	12 10·6	22
90	6 30·5	10 31·9	11 5·2	20
92	7 30·4	11 14·5	11 8·6	16
93	8 29·6	11 43·9	13 3·2	11
96	9 28·4	11 54·2	15 0·3	6
104	10 29·1	11 48·3	16 7·2	5
94	11 29·1	11 36·1	17 7·2	7
Equat. of Time *to be added to app. time...*		0	...	...

	May.			
86	29·1	11 16·5	17 4·1	20
89	1 30·1	10 57·9	17 1·9	22
85	2 31·4	10 38·3	16 6·6	23
82	3 30·3	10 25·1	15 9·1	22
93	4 29·2	10 16·0	14 6·0	20
97	5 30·4	10 18·8	13 3·9	16
99	6 29·3	10 41·6	12 4·2	12
105	7 29·7	11 20·6	12 7·0	7
103	8 30·0	11 46·9	13 9·0	5
102	9 30·5	11 52·6	15 11·2	7
97	10 31·2	11 46·8	16 3·2	12
89	11 30·0	11 31·2	17 0·1	17
Equat. of Time *to be added to app. time...*		−4	...	...

	June.			
79	30·3	11 13·4	16 8·8	23
85	1 30·0	10 55·5	16 10·1	22
85	2 30·0	10 39·8	16 7·9	20
92	3 30·0	10 29·6	15 9·8	16
98	4 30·3	10 24·9	14 8·3	11
96	5 29·6	10 31·5	13 9·0	6
107	6 29·6	10 52·8	13 0·8	5
98	7 30·4	11 24·7	13 1·1	8
97	8 30·2	11 44·0	13 10·4	12
92	9 31·1	11 49·1	14 11·4	17
85	10 30·3	11 41·8	15 11·0	20
83	11 31·1	11 28·7	16 7·0	22
	...	0	...	...

	July.			
88	32·0	11 13·1	17 1·2	19
89	1 31.1	10 57·6	17 1·8	16
100	2 30·6	10 45·2	16 10·1	11
101	3 31·5	10 37·4	16 3·4	6
101	4 31·1	10 33·1	14 11·3	5
99	5 29·7	10 34·2	13 10·0	8
101	6 29·5	10 51·5	12 10·6	13
96	7 30·4	11 12·3	12 8·8	18
91	8 30·7	11 39·2	13 4·9	21
86	9 29·7	11 48·5	14 7·8	22
91	10 30·5	11 39·5	15 7·3	23
89	11 32·6	11 26·7	16 6·5	22
Equat. of Time *to be added to app. time...*		+ 5	...	...

	August.			
95	31·2	11 17·2	17 8·4	11
99	1 29·5	11 4·6	17 11·6	6
105	2 29·0	10 51·8	17 4·6	5
102	3 29·3	10 35·5	16 5·5	7
97	4 29·6	10 30·2	15 0·4	13
96	5 30·0	10 28·7	13 5·6	17
89	6 29·7	10 38·3	12 0·0	21
85	7 29·2	11 8·2	11 9·5	22
90	8 29·8	11 37·4	12 9·9	25
86	9 30·8	11 47·0	14 4·3	22
91	10 30·9	11 42·3	15 10·3	19
91	11 30·4	11 30·1	17 0·0	16
Equat. of Time *to be added to app. time...*		+4	...	...

	September.			
96	31·1	11 20·1	18 3·8	4
96	1 31·3	11 2·6	18 4·8	7
97	2 30·4	10 48·7	17 10·8	12
93	3 30·3	10 34·9	16 6·0	17
88	4 30·2	10 21·3	14 11·3	20
82	5 29·0	10 16·9	13 2·7	22
92	6 29·7	10 32·1	11 7·5	23
82	7 30·7	11 5·2	11 9·3	22
89	8 30·0	11 39·3	12 10·3	20
92	9 31·4	11 50·5	14 9·9	16
91	10 30·7	11 46·3	16 4·9	11
101	11 32·2	11 34·8	17 8·5	6
	...	−5	...	...

	October.			
93	29·1	11 19·3	18 6·3	11
95	1 29·3	11 1·9	18 3·5	16
89	2 28·1	10 42·9	17 7·7	20
93	3 29·1	10 26·9	16 6·0	22
95	4 30·8	10 14·6	14 9·0	23
86	5 31·3	10 12·2	13 1·3	22
91	6 31·2	10 29·4	11 8·2	20
97	7 31·2	11 11·8	11 11·6	17
97	8 31·6	11 46·0	13 4·9	13
97	9 30·9	11 54·1	15 2·0	7
98	10 28·7	11 48·9	16 9·7	4
96	11 29·8	11 35·3	17 11·1	7
Equat. of Time *to be added to app. time...*		−14	...	...

	November.			
85	32·6	11 17·8	17 11·6	20
81	1 31·5	10 58·2	17 8·8	22
83	2 30·5	10 39·0	17 0·0	23
84	3 29·6	10 24·2	16 0·0	22
94	4 30·0	10 14·7	14 6·0	20
89	5 32·1	10 17·3	13 3·6	16
99	6 30·0	10 40·4	12 3·3	13
99	7 30·1	11 21·3	12 7·5	7
99	8 29·4	11 47·6	13 11·3	5
99	9 29·5	11 53·8	15 7·3	6
93	10 29·0	11 46·8	16 8·6	12
96	11 30·8	11 32·7	17 6·1	17
Equat. of Time *to be added to app. time...*		−15	...	...

	December.			
80	31·3	11 12·6	17 3·1	23
85	1 30·4	10 54·7	17 3·4	21
86	2 29·9	10 40·8	16 9·6	19
97	3 29·3	10 28·8	15 10·9	16
102	4 31·1	10 23·9	14 11·3	11
103	5 30·9	10 30·7	13 9·7	8
109	6 31·5	10 53·0	13 0·6	5
100	7 31·2	11 24·0	13 2·7	7
100	8 29·1	11 45·5	14 0·8	12
90	9 28·5	11 48·3	15 3·9	17
95	10 28·9	11 42·5	16 4·6	20
84	11 30·6	11 27·6	17 1·7	21
	...	−4	...	...

The argument of all the Tables is the time of the Moon's transit at Greenwich, taken immediately from the Nautical Almanac, which only amounts to neglecting the Moon's proper motion during twelve minutes.

TABLE II. (Interpolated from Table I.)

Showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water at Liverpool Old Dock, for each month in the year.

Moon's Transit.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Mean.
h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
30	11 13·7	11 18·3	11 19·1	11 19·4	11 16·3	11 13·4	11 13·5	11 17·5	11 20·4	11 19·1	11 18·4	11 12·9	11 17·1
1 30	10 59·5	11 8·2	11 3·9	11 1·1	10 57·9	10 55·5	10 57·8	11 4·5	11 3·0	11 1·7	10 58·7	10 54·8	11 0·7
2 30	10 47·0	10 49·7	10 49·4	10 43·4	10 38·6	10 39·8	10 45·2	10 51·6	10 48·8	10 42·3	10 39·1	10 40·8	10 43·9
3 30	10 37·1	10 37·3	10 33·3	10 30·4	10 25·1	10 29·6	10 37·6	10 35·4	10 34·0	10 26·7	10 24·1	10 28·7	10 31·5
4 30	10 31·1	10 27·3	10 20·3	10 14·2	10 16·0	10 24·9	10 33·1	10 30·2	10 21·3	10 14·7	10 14·7	10 23·9	10 22·7
5 30	10 33·8	10 26·3	10 16·2	10 12·8	10 18·8	10 31·6	10 34·2	10 28·7	10 16·9	10 12·2	10 17·1	10 30·6	10 23·3
6 30	10 49·3	10 37·9	10 30·2	10 31·8	10 41·9	10 52·9	10 51·6	10 38·4	10 32·1	10 29·1	10 40·4	10 52·5	10 41·0
7 30	11 16·1	11 8·0	11 5·8	11 8·5	11 20·6	11 24·6	11 12·2	11 8·6	11 4·8	11 11·0	11 21·3	11 23·4	11 14·4
8 30	11 37·8	11 37·4	11 40·7	11 44·0	11 46·9	11 44·0	11 38·9	11 37·4	11 39·3	11 45·1	11 47·9	11 45·7	11 42·2
9 30	11 45·0	11 51·0	11 50·3	11 54·3	11 52·5	11 49·2	11 48·5	11 46·9	11 50·3	11 54·0	11 53·8	11 48·2	11 50·4
10 30	11 38·5	11 44·0	11 44·9	11 48·2	11 46·9	11 41·8	11 39·6	11 42·4	11 46·4	11 48·7	11 46·7	11 42·2	11 44·2
11 30	11 34·2	11 31·5	11 33·4	11 36·0	11 31·2	11 28·9	11 27·2	11 30·1	11 35·2	11 35·3	11 32·9	11 27·7	11 32·0

TABLE III. (Interpolated from Table I.)

Showing the Height of High Water at Liverpool Old Docks, corresponding to the Apparent Solar Time of the Moon's Transit, in each month of the year.

Moon's Transit.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Mean.
h m	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
30	17·47	18·05	18·38	18·01	17·33	16·73	17·08	17·68	18·30	18·52	17·95	17·25	17·73
1 30	17·74	18·04	18·49	17·88	17·15	16·84	17·14	17·96	18·39	18·28	17·73	17·28	17·78
2 30	17·52	17·69	17·63	17·01	16·56	16·74	16·84	17·37	17·89	17·62	16·99	16·80	17·22
3 30	16·08	16·73	16·31	15·98	15·75	15·81	16·29	16·46	16·50	16·48	16·01	15·89	16·19
4 30	15·14	15·20	14·47	14·44	14·48	14·69	14·96	15·03	14·94	14·76	14·50	14·95	14·96
5 30	13·69	13·39	13·01	12·89	13·33	13·75	13·83	13·46	13·19	13·15	13·33	13·82	13·40
6 30	12·61	11·96	11·42	11·44	12·35	13·07	12·87	12·00	11·63	11·70	12·28	13·06	12·20
7 30	12·38	11·78	11·31	11·71	12·58	13·09	12·72	11·80	11·78	11·95	12·62	13·21	12·24
8 30	13·56	12·79	12·68	13·28	13·75	13·86	13·39	12·82	12·86	13·37	13·95	14·07	13·36
9 30	14·95	14·47	14·62	15·07	15·91	14·93	14·64	14·34	14·78	15·13	15·61	15·35	14·98
10 30	15·98	15·96	16·54	16·61	16·28	15·91	15·61	15·84	16·38	16·83	16·73	16·38	16·25
11 30	16·73	17·39	17·67	17·60	17·01	16·57	16·52	16·99	17·69	17·92	17·50	17·14	17·23

Table IV.

Showing the Difference in the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Mean Interval, for every month in the year.

Moon's Transit.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
h m	m	m	m	m	m	m	m	m	m	m	m	m
30	− 3·4	+ 1·2	+ 2·0	+ 2·3	− 0·8	− 3·7	− 3·6	+ 0·4	+ 3·3	+ 2·0	+ 1·3	− 4·2
1 30	− 1·2	+ 8·2	+ 3·2	+ 1·6	− 2·8	− 5·2	− 2·9	+ 3·8	+ 2·3	+ 1·0	− 2·0	− 5·9
2 30	+ 3·1	+ 5·8	+ 5·5	− 0·5	− 5·3	− 4·1	+ 1·3	+ 7·7	+ 4·9	− 1·6	− 4·8	− 3·1
3 30	+ 5·6	+ 5·8	+ 1·8	− 1·1	− 6·4	− 1·9	+ 6·1	+ 3·9	+ 2·5	− 4·8	− 7·4	− 8·4
4 30	+ 8·4	+ 4·6	− 2·4	− 8·5	− 6·7	+ 2·2	+10·4	+ 7·5	− 1·4	− 8·0	− 8·0	− 7·2
5 30	+10·5	+ 3·0	− 7·1	−10·5	− 4·5	+ 8·3	+10·9	+ 5·4	− 6·4	−11·1	− 6·2	+ 7·3
6 30	+ 8·3	− 3·1	−10·8	− 9·2	+ 0·9	+11·9	+10·6	− 2·6	− 8·9	−11·9	− 0·6	+11·5
7 30	+ 1·7	− 6·4	− 8·6	− 5·9	+ 6·2	+10·2	− 3·9	− 5·8	− 9·3	+ 3·4	+ 6·9	+ 7·3
8 30	− 4·4	− 4·8	− 1·5	+ 1·8	+ 4·7	+ 1·8	− 3·3	− 0·4	− 1·5	+ 7·3	+ 5·7	+ 7·9
9 30	− 5·4	+ 0·6	− 0·1	+ 3·9	+ 2·1	− 1·2	− 1·9	+ 1·9	+ 5·3	+ 3·6	+ 8·8	− 2·2
10 30	− 5·7	− 0·2	+ 0·7	+ 4·0	+ 2·7	− 2·4	− 4·6	+ 3·9	+ 2·2	+ 4·5	+ 2·5	− 2·0
11 30	+ 2·2	− 0·5	+ 1·4	+ 4·0	− 0·8	− 5·3	− 4·8	− 1·9	+ 3·2	+ 3·3	+ 0·9	− 4·3

Table V.

Showing the Difference in the Height of High Water and the Mean Height for every month in the year.

Moon's Transit.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
h m	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
30	−·26	+·32	+·65	+·28	−·40	−1·00	−·65	−·05	+·57	+·79	+·22	−·48
1 30	−·04	+·26	+·71	+·10	−·63	− ·94	−·64	+·18	+·61	+·50	−·05	−·50
2 30	+·30	+·47	+·41	−·21	−·66	− ·48	−·38	+·15	+·67	+·40	−·23	−·42
3 30	−·11	+·54	+·12	−·21	−·44	− ·38	+·10	+·27	+·31	+·29	−·18	−·30
4 30	+·18	+·24	−·49	−·52	−·48	− ·27	00	+·07	−·02	−·20	−·46	−·01
5 30	+·29	−·01	−·39	−·51	−·07	+ ·35	+·43	+·06	−·21	−·25	−·07	+·42
6 30	+·41	−·24	−·78	−·76	+·15	+ ·87	+·67	−·20	−·57	−·50	+·08	+·86
7 30	+·14	−·46	−·93	−·53	+·34	+ ·85	+·48	−·44	−·46	−·29	+·38	+·97
8 30	+·20	−·57	−·68	−·08	+·19	+ ·50	+·03	−·54	−·50	+·01	+·59	+·71
9 30	−·03	−·51	−·36	+·09	+·93	− ·05	−·34	−·64	−·20	+·15	+·63	+·37
10 30	−·27	−·29	+·29	+·36	+·03	− ·34	−·64	−·41	+·13	+·58	+·48	+·13
11 30	−·50	+·16	+·44	+·37	−·22	− ·66	−·71	−·24	+·46	+·69	+·27	−·09

The quantities in this and the preceding Table are chiefly owing to the correction for the Moon's Declination.

Table VI.

Showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Height of High Water, at the Liverpool Old Docks, corresponding to the Apparent Solar Time of the Moon's Transit, for every minute of her Horizontal Parallax.

Number of Observations.	Hor. Par. 54′. Moon's Transit.	Interval.	Height of Tide.	Moon's Declination.
	h m	h m	ft. in.	°
199	30·3	11 26·4	16 7·0	15
194	1 30·6	11 7·2	16 5·8	15
189	2 29·9	10 49·5	15 9·9	15
165	3 29·5	10 32·1	14 8·4	15
149	4 29·1	10 23·6	13 7·3	16
119	5 29·5	10 24·8	12 3·4	16
124	6 31·5	10 46·5	11 0·5	17
140	7 30·4	11 27·5	11 4·8	15
181	8 30·4	11 57·7	12 8·3	15
180	9 30·3	12 3·6	14 1·8	15
197	10 29·7	11 55·3	15 4·5	15
187	11 29·5	11 41·4	16 3·6	15

Number of Observations.	Hor. Par. 55′. Moon's Transit.	Interval.	Height of Tide.	Moon's Declination.
	h m	h m	ft. in.	°
156	30·2	11 23·1	16 10·6	14
169	1 31·1	11 5·3	16 7·8	15
181	2 31·1	10 48·9	16 0·2	15
199	3 30·0	10 34·8	15 1·3	15
234	4 31·0	10 23·5	13 10·0	16
246	5 30·6	10 25·8	12 5·8	15
255	6 29·8	10 44·9	11 4·3	15
223	7 29·7	11 24·6	11 5·4	15
204	8 29·5	11 53·0	12 9·4	15
181	9 30·3	12 0·9	14 4·1	15
173	10 30·0	11 53·3	15 6·9	15
164	11 29·5	11 39·8	16 4·6	14

	Hor. Par. 56′.			
119	30·7	11 16·0	17 3·5	14
119	1 31·0	11 1·3	17 1·1	14
113	2 30·0	10 46·3	16 8·1	14
145	3 29·8	10 33·7	15 7·0	15
144	4 31·3	10 24·0	14 2·1	15
139	5 30·9	10 24·7	12 10·8	15
162	6 29·3	10 43·2	11 8·5	15
143	7 29·7	11 19·9	12 1·2	15
140	8 30·3	11 41·1	13 1·9	14
129	9 30·7	11 56·5	14 8·1	14
121	10 31·0	11 49·4	15 11·9	14
114	11 32·7	11 36·3	16 9·9	15

	Hor. Par. 57′.			
95	31·9	11 17·1	17 6·4	14
109	1 31·5	11 1·9	17 7·6	14
108	2 30·3	10 45·6	17 0·4	14
117	3 30·6	10 33·3	16 2·0	14
131	4 30·7	10 24·6	14 10·6	14
148	5 29·8	10 23·3	13 4·8	15
136	6 30·4	10 41·1	12 6·3	15
132	7 30·3	11 16·0	12 4·0	14
115	8 29·7	11 43·7	13 4·2	15
111	9 29·9	11 51·5	14 9·5	14
108	10 29·7	11 46·7	16 0·3	14
105	11 30·2	11 33·1	17 0·0	14

	Hor. Par. 58′.			
91	30·4	11 15·7	17 11·6	13
97	1 28·4	10 59·2	18 1·4	14
105	2 30·2	10 45·2	17 6·4	14
128	3 31·2	10 31·2	16 7·0	14
131	4 32·2	10 23·0	15 4·3	15
148	5 31·4	10 24·5	14 0·0	15
150	6 30·6	10 38·5	12 10·0	14
138	7 30·5	11 10·7	12 8·0	15
119	8 29·0	11 37·2	13 9·1	14
107	9 29·4	11 46·7	15 1·0	14
101	10 30·6	11 42·2	16 5·2	13
88	11 29·9	11 29·3	17 3·1	14

	Hor. Par. 59′.			
99	30·1	11 13·2	18 4·5	14
99	1 32·1	10 56·5	18 5·6	14
111	2 30·8	10 42·5	18 0·4	15
136	3 30·6	10 30·8	17 2·3	14
200	4 32·4	10 21·8	15 10·5	15
290	5 31·4	10 21·8	14 5·9	15
299	6 29·0	10 34·8	13 3·4	15
194	7 28·8	11 0·8	12 11·6	15
140	8 29·4	11 31·0	13 11·2	15
108	9 29·2	11 41·8	15 5·1	15
100	10 29·0	11 38·5	16 7·4	14
103	11 30·3	11 25·9	17 8·0	14

	Hor. Par. 60′.			
105	32·6	11 10·6	18 7·7	15
111	1 32·3	10 54·9	19 0·9	15
161	2 34·1	10 40·1	18 8·8	15
226	3 29·7	10 28·2	17 8·7	16
147	4 27·0	10 20·5	16 3·4	16
23	5 16·7	10 14·7	15 0·4	15
21	6 45·7	10 43·1	13 0·8	16
148	7 24·4	11 4·6	13 3·4	16
226	8 32·0	11 25·8	14 1·7	16
163	9 28·0	11 37·9	15 7·6	15
114	10 30·7	11 34·3	17 0·6	15
110	11 31·3	11 23·1	18 1·1	14

	Hor. Par. 61′.			
212	30·6	11 6·0	19 2·2	15
200	1 29·3	10 52·0	19 4·7	15
133	2 25·8	10 39·3	18 10·9	16
125	9 35·5	11 33·7	15 11·4	15
196	10 30·9	11 30·1	17 3·9	15
212	11 30·7	11 19·7	18 5·6	15

Mean of the preceding.

Moon's Transit.	Interval.	Height of Tide.
h m	h m	ft. in.
0 30·8	11 16·0	17 9·7
1 30·8	11 0·0	17 10·2
2 30·3	10 44·7	17 4·0
3 30·2	10 32·0	16 2·0
4 30·5	10 23·0	14 10·3
5 27·6	10 22·8	13 6·2
6 32·3	10 41·7	12 3·0
7 29·1	11 14·9	12 3·8
8 30·0	11 41·3	13 5·0
9 30·4	11 49·0	15 0·0
10 30·2	11 43·7	16 3·4
11 30·5	11 31·0	17 3·0

Table VII. (Interpolated from Table VI.)

Moon's Transit.	H. P. 54′.		H. P. 55′.		H. P. 56′.		H. P. 57′.		H. P. 58′.		H. P. 59′.		H. P. 60′.		H. P. 61′.	
	Interval.	Height of Tide.	Interval.	Height of Tide.	Interval.	Height of Tide.	Interval.	Height of Tide.	Interval.	Height of Tide.	Interval.	Height of Tide.	Interval.	Height of Tide.	Interval.	Height of Tide.
h m	h m	ft.	h m	ft.	h m	ft.	h m	ft.	h m	ft.	h m	ft.	h m	ft.	h m	ft.
30	11 26·4	16·58	11 23·1	16·88	11 16·3	17·29	11 18·1	17·53	11 15·9	17·96	11 13·2	18·37	11 11·8	18·62	11 6·3	19·17
1 30	11 7·5	16·46	11 4·7	16·64	11 1·8	17·09	11 2·6	17·63	10 58·4	18·12	10 57·5	18·45	10 56·0	19·09	10 51·7	19·39
2 30	10 49·5	15·82	10 49·5	16·02	10 46·3	16·67	10 45·7	17·04	10 45·1	17·54	10 42·8	18·04	10 41·9	18·75	10 38·4	18·87
3 30	10 31·3	14·69	10 34·8	15·11	10 33·6	15·58	10 33·5	16·17	10 31·6	16·58	10 31·0	17·19	10 28·1	17·70		
4 30	10 23·7	13·59	10 23·7	13·86	10 24·3	14·20	10 24·7	14·89	10 23·3	15·36	10 21·9	15·87	10 19·8	17·72		
5 30	10 25·0	12·28	10 25·8	12·49	10 24·7	12·91	10 23·3	13·39	10 24·3	14·01	10 21·8	14·49				
6 30	10 45·3	11·07	10 45·1	11·36	10 43·8	11·70	10 40·8	12·53	10 38·1	12·84	10 35·5	13·29				
7 30	11 27·0	11·39	11 24·9	11·45	11 20·2	12·10	11 15·7	12·33	11 10·2	12·66	11 1·9	12·96	11 8·5	13·29		
8 30	11 57·5	12·68	11 53·3	12·79	11 48·4	13·15	11 43·9	13·36	11 37·8	13·77	11 31·4	13·93	11 24·7	14·10		
9 30	12 3·6	14·14	12 0·8	14·33	11 56·2	14·66	11 51·5	14·79	11 47·8	15·09	11 41·9	15·42	11 38·3	15·68	11 33·5	16·06
10 30	11 55·2	15·38	11 53·3	15·57	11 49·6	15·97	11 46·6	16·04	11 42·3	16·43	11 38·3	16·62	11 34·6	17·04	11 30·3	17·31
11 30	11 41·2	16·30	11 39·6	16·39	11 34·9	16·79	11 32·2	17·00	11 29·3	17·26	11 26·0	17·66	11 22·9	18·08	11 19·9	18·45

Table VIII.

Showing the Difference in the Interval between the Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to fifty-seven minutes of the Moon's Horizontal Parallax.

Moon's Transit.	H. P. 54′.	H. P. 55′.	H. P. 56′.	H. P. 57′.	H. P. 58′.	H. P. 59′.	H. P. 60′.	H. P. 61′.
h m	m	m	m	m	m	m	m	m
30	+ 8·3	+5·0	−1·8	0	−2·2	− 4·9	− 6·3	−11·8
1 30	+ 4·9	+2·1	+0·8	0	−4·2	− 5·1	− 6·6	−10·9
2 30	+ 3·8	+3·8	+0·6	0	−0·6	− 2·9	− 3·8	− 7·3
3 30	− 2·2	+1·3	+0·1	0	−1·9	− 2·5	− 5·4	
4 30	− 1·0	−1·0	−0·4	0	−1·4	− 2·8	− 4·9	
5 30	+ 1·7	+2·5	+1·4	0	+1·0	− 1·5		
6 30	+ 4·5	+4·3	+3·0	0	−2·7	− 5·3		
7 30	+11·3	+9·2	+4·5	0	−5·5	−13·8	− 7·2	
8 30	+13·6	+9·4	+4·5	0	−6·1	−12·5	−19·2	
9 30	+12·1	+9·3	+4·7	0	−3·7	− 9·6	−13·2	−18·0
10 30	+ 8·6	+6·7	+3·0	0	−4·3	− 8·3	−12·0	−16·3
11 30	+ 8·0	+6·4	+1·7	0	−3·9	− 7·2	−10·3	−13·3

Table IX.

Showing the Difference between the Height of High Water and the Height corresponding to fifty-seven minutes of the Moon's Horizontal Parallax.

Moon's Transit.	H. P. 54′.	H. P. 55′.	H. P. 56′.	H. P. 57′.	H. P. 58′.	H. P. 59′.	H. P. 60′.	H. P. 61′.
h m	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
30	− ·95	− ·65	−·24	0	+·46	+ ·84	+1·09	+1·64
1 30	−1·17	− ·99	−·54	0	+·49	+ ·82	+1·46	+1·76
2 30	−1·22	−1·02	−·37	0	+·50	+1·00	+1·71	+1·83
3 30	−1·48	−1·06	−·59	0	+·41	+1·02	+1·53	
4 30	−1·30	−1·03	−·69	0	+·47	+ ·98	+2·83	
5 30	−1·11	− ·90	−·48	0	+·62	+1·10		
6 30	−1·46	−1·17	−·83	0	+·31	+ ·76		
7 30	− ·94	− ·88	−·23	0	+·33	+ ·63	+ ·96	
8 30	− ·68	− ·57	−·21	0	+·41	+ ·57	+ ·74	
9 30	− ·65	− ·46	−·13	0	+·30	+ ·63	+ ·89	+1·27
10 30	− ·66	− ·47	−·07	0	+·39	+ ·58	+1·00	+1·27
11 30	− ·70	− ·61	−·21	0	+·26	+ ·66	+1·08	+1·45

Table X.

Showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Height of High Water, at the Liverpool Old Docks, corresponding to the Apparent Solar Time of the Moon's Transit, for every three degrees of her Declination north and south. The Equation of Time to be added to Apparent Time.

Number of Observations.	1° 30′ N. to 1° 30′ South Declination.				
	Moon's Transit.	Equation of Time.	Interval.	Height of Tide.	Hor. Par.
	h m	m	h m	ft. in.	′
48	29·3	+ 2·5	11 22·2	18 4·0	57·0
45	1 29·5	+ 6·0	11 5·0	18 3·3	57·4
52	2 28·7	+ 9·2	10 51·6	17 6·0	57·0
51	3 28·2	+ 8·8	10 39·3	16 9·5	57·1
46	4 31·3	+ 6·1	10 31·4	15 0·1	56·8
44	5 30·9	+ 2·8	10 34·5	14 1·3	57·0
39	6 30·6	− 2·3	10 54·8	13 0·9	56·8
46	7 29·7	− 5·8	11 23·3	12 11·0	56·8
47	8 28·5	− 9·1	11 46·8	14 1·3	57·0
46	9 28·6	− 9·3	11 53·8	15 1·6	57·1
55	10 33·3	− 6·5	11 47·8	16 10·5	57·3
40	11 34·1	− 2·2	11 33·5	16 10·3	57·9

Number of Observations.	1° 30′ to 4° 30′ North Declination.				
	Moon's Transit.	Equation of Time.	Interval.	Height of Tide.	Hor. Par.
	h m	m	h m	ft. in.	′
54	27·3	+ 2·2	11 21·1	18 3·5	57·2
52	1 30·0	+ 6·3	11 5·7	18 3·7	57·1
45	2 29·2	+ 8·2	10 51·4	17 1·1	57·5
54	3 33·2	+ 8·6	10 37·5	16 4·5	57·0
50	4 30·2	+ 6·1	10 28·1	15 2·1	56·9
42	5 31·0	+ 2·6	10 35·4	13 7·4	56·7
49	6 29·5	+ 2·1	10 54·0	13 1·6	56·9
43	7 29·0	− 6·6	11 23·6	13 2·9	57·1
47	8 27·3	− 7·9	11 47·0	13 10·0	57·0
43	9 27·6	− 8·9	11 50·1	15 5·6	57·4
50	10 27·5	− 6·4	11 44·2	16 8·4	57·0
45	11 25·3	− 2·7	11 37·4	17 7·6	57·3

Number of Observations.	4° 30′ to 7° 30′ North Declination.				
	Moon's Transit.	Equation of Time.	Interval.	Height of Tide.	Hor. Par.
	h m	m	h m	ft. in.	′
55	31·3	+ 1·6	11 19·6	18 2·0	57·3
47	1 30·0	+ 6·5	11 5·7	18 5·9	57·2
48	2 30·9	+ 6·8	10 50·4	17 8·5	57·1
48	3 29·1	+ 7·8	10 38·6	16 4·7	56·8
46	4 31·8	+ 5·5	10 31·0	15 0·0	57·0
42	5 31·3	+ 2·3	10 42·4	13 9·1	56·7
45	6 31·8	− 2·8	10 52·6	12 8·2	57·3
45	7 30·0	− 5·2	11 24·2	13 2·4	58·2
44	8 31·1	− 7·2	11 49·9	13 5·9	56·4
53	9 28·2	− 7·7	11 53·8	15 2·0	57·1
46	10 33·8	− 5·2	11 46·7	16 8·6	57·3
50	11 31·0	− 1·7	11 34·3	17 2·9	57·5

	1° 30′ to 4° 30′ South Declination.				
52	30·4	+ 3·0	11 18·3	18 6·6	57·7
41	1 30·5	+ 7·0	11 3·6	18 3·5	58·0
48	2 30·9	+ 8·1	10 49·8	17 7·1	57·5
41	3 31·9	+ 8·3	10 39·9	16 6·2	56·7
41	4 29·3	+ 6·6	10 31·6	15 5·3	57·2
45	5 29·0	+ 2·3	10 34·5	13 9·1	56·6
49	6 30·1	+ 1·1	10 53·5	12 11·4	57·0
44	7 33·1	− 6·5	11 27·1	13 0·1	57·0
45	8 32·4	− 8·1	11 41·3	13 1·6	57·3
54	9 30·0	− 8·6	11 54·4	15 3·8	56·7
47	10 28·5	− 6·0	11 41·8	16 8·0	57·3
54	11 31·1	− 4·6	11 34·8	17 9·0	57·4

	4° 30′ to 7° 30′ South Declination.				
53	29·8	+ 2·5	11 20·4	18 0·0	57·3
43	1 31·3	+ 6·0	11 5·2	18 6·0	57·6
46	2 31·3	+ 8·0	10 50·4	17 8·7	57·6
44	2 32·0	+ 7·9	10 38·3	16 6·4	57·3
45	4 30·0	+ 5·0	10 29·6	15 5·2	56·8
47	5 27·0	+ 3·1	10 32·7	14 1·4	57·0
51	6 29·4	− 2·1	10 51·0	12 10·3	57·0
50	7 30·4	− 5·1	11 21·6	12 11·5	57·0
40	8 29·0	− 6·8	11 47·0	13 10·0	56·9
48	9 31·9	− 7·5	11 54·5	15 6·3	57·2
46	10 30·3	− 5·6	11 44·9	16 11·5	57·8
52	11 30·2	− 1·9	11 32·0	18 0·0	57·7

	7° 30′ to 10° 30′ North Declination.				
52	30·1	+ 1·3	11 20·3	18 1·1	57·1
54	1 30·7	+ 4·3	11 4·7	18 2·1	57·2
50	2 28·7	+ 6·0	10 49·2	17 5·1	57·3
55	3 27·8	+ 5·9	10 41·5	16 5·2	56·6
54	4 29·7	+ 5·1	10 30·3	14 11·3	56·7
45	5 28·9	+ 1·2	10 32·1	13 9·4	56·4
51	6 27·5	− 1·5	10 49·7	12 8·3	56·6
48	7 27·8	− 4·3	11 22·5	12 7·2	56·5
48	8 31·7	− 6·6	11 45·2	14 1·7	57·1
58	9 30·2	− 6·2	11 54·8	15 1·3	56·7
51	10 33·3	− 4·5	11 46·4	16 6·7	57·3
47	11 30·8	− 1·1	11 35·6	17 7·9	56·9

	10° 30′ to 13° 30′ North Declination.				
54	30·8	+ 1·2	11 19·3	18 0·1	57·3
64	1 32·3	+ 2·3	11 3·4	17 10·2	56·2
45	2 31·7	+ 3·8	10 48·8	17 4·5	57·0
53	3 29·9	+ 3·9	10 35·3	16 0·4	56·8
51	4 30·7	+ 2·6	10 28·0	14 10·4	56·7
57	5 30·4	+ 1·3	10 27·4	13 6·3	56·7
54	6 30·4	− 1·2	10 48·0	12 4·6	56·5
60	7 27·4	− 2·3	11 20·1	12 6·5	56·5
59	8 30·0	− 4·2	11 48·5	13 7·7	56·5
59	9 30·5	− 2·4	11 52·0	14 11·2	57·0
60	10 29·1	− 2·6	11 48·5	16 2·6	56·9
61	11 27·0	− 1·4	11 36·6	17 2·5	56·8

	13° 30′ to 16° 30′ North Declination.				
58	31·6	+ 0·1	11 18·8	17 9·6	56·7
54	1 28·0	0·0	11 3·1	17 7·8	56·7
66	2 28·9	+ 1·5	10 47·3	16 10·8	55·8
67	3 27·6	+ 0·1	10 33·2	16 1·7	56·5
71	4 28·8	+ 0·1	10 25·2	14 8·1	56·4
75	5 29·0	+ 1·0	10 27·1	13 2·1	56·2
72	6 30·6	0·0	10 44·7	12 3·1	56·4
69	7 32·2	− 1·0	11 20·8	12 1·6	56·3
63	8 31·4	− 0·3	11 46·0	13 4·3	56·7
64	9 31·3	− 0·4	11 52·6	14 11·3	56·0
71	10 29·4	− 0·8	11 46·6	16 6·1	56·8
70	11 32·5	0·0	11 34·1	17 1·1	56·8

	7° 30′ to 10° 30′ South Declination.				
42	29·9	+ 1·2	11 18·7	18 4·9	57·8
53	1 29·0	+ 4·8	11 3·9	18 5·0	57·7
52	2 30·5	+ 5·2	10 49·1	17 8·2	57·3
51	3 27·3	+ 5·8	10 37·0	16 9·9	57·4
49	4 32·3	+ 5·6	10 29·5	15 1·8	57·4
46	5 32·7	+ 1·1	10 32·1	13 8·7	56·9
44	6 32·6	− 1·2	10 49·3	13 0·0	57·2
46	7 31·0	− 5·7	11 22·0	12 6·4	56·9
54	8 28·5	− 5·5	11 43·4	13 10·3	57·5
50	9 30·0	− 4·8	11 52·2	15 8·3	57·3
53	10 29·4	− 4·9	11 46·0	16 7·5	57·6
51	11 30·3	− 2·5	11 33·0	18 1·9	57·8

	10° 30′ to 13° 30′ South Declination.				
54	30·6	+ 1·4	11 16·3	18 4·7	57·9
57	1 30·3	+ 2·7	11 1·8	18 5·4	57·8
59	2 30·5	+ 4·0	10 46·8	17 8·1	57·7
48	3 30·3	+ 4·1	10 35·5	16 7·8	57·4
59	4 28·9	+ 3·1	10 27·3	15 1·9	57·1
57	5 30·8	+ 1·4	10 29·0	13 10·7	57·3
59	6 28·7	− 1·9	10 45·0	12 6·6	57·0
49	7 30·0	− 3·6	11 16·6	12 7·5	57·5
53	8 28·4	− 4·0	11 42·4	13 7·8	57·3
55	9 30·6	− 3·2	11 49·2	15 1·4	57·7
53	10 30·5	− 1·5	11 45·3	16 9·0	57·7
65	11 31·5	− 1·2	11 31·6	17 7·2	57·8

	13° 30′ to 16° 30′ South Declination.				
61	31·2	0·0	11 15·2	18 2·5	58·0
61	1 31·2	− 0·1	11 0·3	18 2·6	58·5
60	2 29·2	+ 0·6	10 45·0	17 6·6	57·6
62	3 30·6	+ 0·4	10 32·6	16 4·8	57·5
60	4 30·5	+ 0·7	10 23·5	15 1·7	57·3
64	5 29·0	+ 0·3	10 25·0	14 1·0	57·1
58	6 30·6	0·0	10 42·6	12 7·5	57·3
64	7 30·2	− 0·8	11 14·9	12 7·9	57·5
73	8 31·0	− 0·9	11 40·6	13 6·3	57·4
63	9 31·5	− 1·1	11 47·9	15 1·6	57·8
67	10 30·7	− 0·3	11 42·2	16 7·0	57·9
54	11 30·7	+ 0·2	11 29·5	17 4·6	58·0

TABLE X. (Continued.)

Number of Observations.	Moon's Transit.	Equation of Time.	Interval.	Height of Tide.	Hor. Par.
	16° 30′ to 19° 30′ North Declination.				
	h m	m	h m	ft. in.	′
92	32·6	− 0·4	11 18·4	17 1·0	56·3
95	1 31·6	− 3·0	11 1·0	17 2·1	56·5
97	2 31·3	− 4·0	10 45·0	16 8·7	56·5
93	3 30·8	− 3·8	10 31·0	15 10·9	56·1
100	4 31·6	− 2·6	10 21·7	14 4·3	56·1
94	5 30·7	− 1·5	10 21·6	12 9·5	56·0
95	6 29·5	+ 0·9	10 41·5	11 10·5	55·8
106	7 31·0	+ 2·7	11 16·8	12 0·0	56·2
89	8 31·1	+ 3·2	11 44·8	13 3·0	56·2
102	9 28·8	+ 4·2	11 52·8	14 7·0	56·2
95	10 30·6	+ 1·9	11 45·1	15 11·0	56·5
91	11 32·3	+ 1·2	11 33·3	16 9·9	56·4
	16° 30′ to 19° 30′ South Declination.				
83	29·9	− 0·9	11 2·4	17 11·2	58·2
84	1 30·1	− 2·0	10 56·6	18 2·5	58·7
87	2 28·6	− 3·3	10 42·3	17 9·9	58·2
93	3 29·0	− 4·1	10 35·2	16 9·1	58·4
96	4 30·3	− 3·2	10 21·4	14 10·5	57·8
98	5 30·5	− 0·7	10 18·8	13 7·5	57·5
100	6 31·7	+ 1·0	10 35·5	12 9·9	57·5
92	7 31·1	+ 3·0	11 8·6	12 7·9	57·9
91	8 31·6	+ 3·1	11 36·4	13 8·0	57·9
80	9 31·2	+ 4·4	11 42·8	15 2·5	58·0
88	10 29·0	+ 2·8	11 39·1	16 5·7	58·3
83	11 31·9	+ 0·9	11 26·3	17 5·8	58·7
	22° 30′ to 25° 30′ North Declination.				
48	30·8	− 1·3	11 7·6	17 5·3	58·7
57	1 33·3	− 4·7	10 51·8	17 8·9	58·8
45	2 32·0	− 6·6	10 35·4	17 4·4	58·5
54	3 29·5	− 6·0	10 23·5	16 5·5	58·2
51	4 30·0	− 5·5	10 13·5	15 0·5	58·2
56	5 29·2	− 0·4	10 14·0	13 5·7	57·7
54	6 31·9	+ 1·2	10 29·9	12 1·7	57·7
52	7 27·4	+ 4·2	11 2·5	11 11·4	58·0
61	8 34·6	+ 5·1	11 29·8	13 2·1	58·1
50	9 30·2	+ 7·2	11 38·5	14 11·1	58·8
52	10 30·5	+ 4·4	11 35·3	15 11·7	58·5
58	11 30·3	+ 1·4	11 25·6	16 9·0	58·0
	22° 30′ to 25° 30′ South Declination.				
57	31·9	− 1·8	11 16·1	16 5·1	56·1
52	1 30·8	− 4·6	10 57·4	16 5·6	56·1
61	2 32·1	− 6·2	10 40·2	16 0·8	56·0
50	3 28·9	− 5·7	10 26·1	15 5·7	55·7
65	4 30·0	− 3·6	10 15·4	13 11·9	55·9
50	5 30·6	− 1·9	10 12·6	12 6·4	55·8
63	6 28·5	+ 0·7	10 30·1	11 2·6	57·2
60	7 32·3	+ 3·9	11 13·0	11 3·9	56·2
62	8 30·8	+ 6·3	11 44·1	12 6·9	56·0
57	9 32·4	+ 6·1	11 52·7	14 2·3	56·0
52	10 29·0	+ 5·3	11 46·8	15 1·3	56·2
51	11 32·4	+ 1·4	11 30·2	16 4·0	56·8

Number of Observations.	Moon's Transit.	Equation of Time.	Interval.	Height of Tide.	Hor. Par.
	19° 30′ to 22° 30′ North Declination.				
	h m	m	h m	ft. in.	′
62	31·0	− 1·7	11 11·4	17 9·7	58·4
61	1 33·1	− 3·6	10 55·7	17 5·1	58·0
56	2 31·0	− 4·1	10 39·4	17 2·0	58·1
72	3 31·1	− 4·1	10 28·0	16 1·5	57·5
64	4 29·9	− 2·6	10 17·7	14 11·0	57·8
67	5 28·0	− 0·3	10 17·8	13 5·0	57·4
70	6 30·1	+ 0·8	10 33·6	12 2·7	57·6
63	7 32·0	+ 3·4	11 7·2	12 2·5	57·8
62	8 28·8	+ 4·3	11 36·7	13 3·6	57·7
65	9 29·8	+ 3·7	11 45·7	14 6·4	57·2
62	10 28·8	+ 3·6	11 39·2	16 2·1	58·1
62	11 30·6	+ 1·0	11 26·2	17 0·1	58·3
	19° 30′ to 22° 30′ South Declination.				
65	30·3	− 0·8	11 15·4	17 1·2	56·9
67	1 27·8	− 4·0	11 0·2	17 0·4	56·5
71	2 29·0	− 5·2	10 41·4	16 5·6	56·7
70	3 28·8	− 3·6	10 28·6	15 9·9	56·6
74	4 30·7	− 3·4	10 18·1	14 4·5	56·3
64	5 32·5	− 0·8	10 18·1	12 8·2	56·2
75	6 30·7	+ 1·3	10 35·3	11 5·2	56·1
65	7 28·5	+ 3·0	11 2·1	11 7·4	56·4
68	8 29·7	+ 4·5	11 44·7	12 7·5	56·1
67	9 28·7	+ 4·5	11 48·8	14 5·7	57·2
67	10 31·8	+ 3·4	11 45·0	15 8·5	56·6
63	11 31·3	+ 1·2	11 32·0	16 7·1	56·9
	Above 25° 30′ North Declination.				
42	31·4	− 2·9	11 11·5	16 4·2	56·8
45	1 28·7	− 5·8	10 55·0	16 1·4	56·3
49	2 31·8	− 7·7	10 35·5	15 11·5	56·3
51	3 31·0	− 7·5	10 22·6	15 1·0	56·3
59	4 32·5	− 5·9	10 9·8	13 7·9	56·1
53	5 33·1	− 1·7	10 9·7	12 3·7	56·2
58	6 29·8	+ 1·9	10 25·4	10 9·0	56·1
54	7 31·4	+ 5·2	11 6·0	10 10·0	56·5
51	8 30·5	+ 8·5	11 44·3	12 1·6	55·9
44	9 30·2	+ 7·6	11 51·0	13 8·3	56·3
47	10 28·9	+ 6·0	11 43·2	15 0·0	56·2
41	11 30·4	+ 2·2	11 30·0	15 6·2	56·4
	Above 25° 30′ South Declination.				
42	28·5	− 2·0	11 6·9	17 2·5	58·3
41	1 30·0	− 5·4	10 50·0	17 5·6	58·4
43	2 28·6	− 7·5	10 34·3	17 0·1	58·4
49	3 30·7	− 7·9	10 20·9	16 1·0	58·0
50	4 31·8	− 6·7	10 9·5	14 8·2	57·7
52	5 28·8	− 1·9	10 8·1	13 2·8	57·7
59	6 29·2	+ 1·5	10 22·2	11 6·5	57·4
47	7 29·1	+ 6·0	10 54·3	11 6·8	58·0
52	8 30·0	+ 7·3	11 30·0	12 10·9	57·8
42	9 29·7	+ 8·6	11 40·0	14 3·6	58·2
44	10 32·7	+ 6·1	11 35·0	15 6·0	58·2
37	11 30·4	+ 2·9	11 20·0	16 5·6	58·7

In forming this Table, it has been assumed that Mr. HUTCHINSON's clock was regulated according to *apparent* solar time; if it was regulated according to *mean* solar time, the interval must be *diminished* by the equation of time given in the third column.

Table XI. (Interpolated from Table X.)

Showing the Interval between the Apparent Time of the Moon's Transit and the Time of High Water at the Liverpool Old Docks for every three degrees of her Declination north *and* south.

Moon's Transit.	0° Dec.	3° N. Dec.	6° N. Dec.	9° N. Dec.	12° N. Dec.	15° N. Dec.	18° N. Dec.	21° N. Dec.	24° N. Dec.	27° N. Dec.	Mean.
h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
30	11 22·1	11 20·4	11 19·9	11 20·3	11 19·5	11 19·2	11 19·0	11 11·7	11 7·8	11 11·9	11 17·2
1 30	11 5·0	11 5·7	11 5·7	11 4·9	11 4·0	11 2·5	11 1·4	10 56·5	11 52·7	10 54·6	11 1·3
2 30	10 51·4	10 51·2	10 50·6	10 49·4	10 49·2	10 47·0	10 45·3	10 39·6	10 35·9	10 36·0	10 45·6
3 30	10 39·1	10 38·1	10 38·5	10 37·0	10 35·3	10 32·8	10 31·2	10 28·2	10 23·4	10 22·8	10 32·6
4 30	10 31·6	10 28·1	10 31·2	10 30·3	10 28·1	10 25·0	10 21·8	10 17·7	10 13·5	10 10·0	10 23·8
5 30	10 34·5	10 35·3	10 35·3	10 32·2	10 27·4	10 27·1	10 21·6	10 17·5	10 14·1	10 9·7	10 25·5
6 30	10 54·7	10 54·0	10 52·2	10 50·7	10 48·0	10 44·5	10 41·6	10 33·6	10 29·4	10 25·4	10 43·4
7 30	11 23·4	11 24·0	11 24·2	11 23·2	11 20·2	11 19·7	11 16·3	11 6·2	11 3·7	11 5·0	11 16·6
8 30	11 47·1	11 47·4	11 49·5	11 45·6	11 48·5	11 45·6	11 44·0	11 37·1	11 30·7	11 43·0	11 43·6
9 30	11 53·8	11 50·0	11 53·7	11 54·8	11 52·0	11 52·5	11 52·8	11 45·7	11 38·5	11 51·0	11 50·5
10 30	11 48·1	11 44·0	11 47·0	11 47·0	11 48·6	11 46·5	11 45·2	11 39·1	11 35·4	11 43·1	11 44·4
11 30	11 34·4	11 36·5	11 34·4	11 35·7	11 36·0	11 34·7	11 33·9	11 26·4	11 25·6	11 30·1	11 32·8
		3° S. Dec.	6° S. Dec.	9° S. Dec.	12° S. Dec.	15° S. Dec.	18° S. Dec.	21° S. Dec.	24° S. Dec.	27° S. Dec.	Mean.
30		11 18·4	11 20·4	11 18·7	11 16·4	11 15·5	11 12·4	11 15·4	11 16·6	11 6·6	11 15·6
1 30		11 3·7	11 5·7	11 3·7	11 1·8	11 0·0	10 56·6	10 59·6	10 57·6	10 50·0	10 59·9
2 30		10 50·0	10 50·9	10 49·2	10 46·9	10 44·9	10 42·0	10 41·1	10 40·5	10 34·0	10 44·3
3 30		10 40·2	10 38·7	10 36·6	10 35·5	10 32·7	10 35·1	10 28·3	10 25·9	10 21·0	10 32·6
4 30		10 31·5	10 29·6	10 29·9	10 27·2	10 23·6	10 21·4	10 18·2	10 15·4	10 9·8	10 22·9
5 30		10 34·7	10 33·0	10 32·0	10 29·0	10 25·1	10 18·8	10 18·0	10 12·6	10 8·2	10 23·4
6 30		10 53·5	10 51·2	10 48·7	10 44·4	10 42·4	10 35·0	10 35·1	10 31·8	10 22·4	10 41·0
7 30		11 25·9	11 21·4	11 21·6	11 16·6	11 14·9	11 8·1	11 2·9	11 13·0	10 54·8	11 13·2
8 30		11 40·7	11 47·4	11 43·7	11 42·8	11 40·2	11 36·4	11 44·7	11 44·1	11 30·0	11 41·0
9 30		11 54·4	11 54·4	11 52·2	11 49·1	11 47·8	11 42·7	11 48·8	11 52·7	11 40·0	11 49·1
10 30		11 41·6	11 44·9	11 45·9	11 45·3	11 42·3	11 39·0	11 45·1	11 46·8	11 35·2	11 42·9
11 30		11 34·7	11 32·0	11 33·0	11 32·0	11 29·6	11 26·6	11 32·4	11 30·2	11 20·1	11 30·1

Table XII.

Showing the Interval between the Apparent Time of the Moon's Transit and the Time of High Water at the Liverpool Old Docks for every three degrees of her Declination north *or* south.

Moon's Transit.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.	Mean.
h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
30	11 22·1	11 19·4	11 20·1	11 19·5	11 17·9	11 17·3	11 15·7	11 13·5	11 12·2	11 9·2	11 16·7
1 30	11 5·0	11 4·7	11 5·7	11 4·3	11 2·9	11 1·2	10 59·0	10 58·0	10 55·2	10 52·3	11 0·8
2 30	10 51·4	10 50·6	10 50·8	10 49·3	10 48·0	10 46·0	10 43·6	10 40·4	10 38·2	10 35·0	10 45·3
3 30	10 39·1	10 39·1	10 38·6	10 38·9	10 35·4	10 32·8	10 33·2	10 28·2	10 24·6	10 21·9	10 33·2
4 30	10 31·6	10 29·8	10 30·4	10 30·1	10 27·3	10 24·3	10 21·6	10 17·9	10 14·4	10 9·9	10 23·7
5 30	10 34·5	10 35·0	10 34·1	10 32·1	10 28·2	10 26·1	10 20·2	10 17·7	10 13·3	10 9·0	10 25·0
6 30	10 54·7	10 53·8	10 51·7	10 49·7	10 46·2	10 43·4	10 38·3	10 34·3	10 30·6	10 23·9	10 42·6
7 30	11 23·4	11 25·0	11 22·8	11 22·4	11 18·4	11 17·9	11 12·2	11 4·6	11 8·3	10 59·9	11 15·5
8 30	11 47·1	11 44·0	11 48·4	11 44·7	11 45·6	11 42·9	11 40·1	11 40·9	11 36·3	11 36·5	11 42·7
9 30	11 53·8	11 52·2	11 54·0	11 53·5	11 50·6	11 50·1	11 47·7	11 47·2	11 45·6	11 45·5	11 50·0
10 30	11 48·1	11 42·8	11 46·0	11 46·4	11 46·9	11 44·4	11 42·1	11 42·1	11 41·1	11 39·2	11 43·9
11 30	11 34·4	11 35·6	11 33·2	11 34·3	11 34·0	11 32·1	11 30·2	11 29·4	11 27·9	11 25·1	11 31·6

Table XIII.

Showing the Difference in the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to fifteen degrees Declination, for every three degrees of her Declination north *and* south.

Moon's Transit.	0	3° N. Dec.	6° N. Dec.	9° N. Dec.	12° N. Dec.	15° N. Dec.	18° N. Dec.	21° N. Dec.	24° N. Dec.	27° N. Dec.
h m	m	m	m	m	m	m	m	m	m	m
30	+ 2·9	+ 1·2	+ 0·7	+ 1·1	+ 0·3	0	— 0·2	— 7·5	—11·4	— 7·3
1 30	+ 2·5	+ 3·2	+ 3·2	+ 2·4	+ 1·5	0	— 1·1	— 6·0	— 9·8	— 7·9
2 30	+ 4·4	+ 4·2	+ 3·6	+ 2·4	+ 2·2	0	— 1·7	— 7·4	—11·1	—11·0
3 30	+ 6·3	+ 5·3	+ 5·7	+ 8·4	+ 2·5	0	— 1·6	— 4·6	— 9·4	—10·0
4 30	+ 6·6	+ 3·1	+ 6·2	+ 5·3	+ 3·1	0	— 3·2	— 7·3	—11·5	—15·0
5 30	+ 7·4	+ 8·2	+ 8·2	+ 5·1	+ 0·3	0	— 5·5	— 9·6	—13·0	—17·4
6 30	+10·2	+ 9·5	+ 7·7	+ 6·2	+ 3·5	0	— 2·9	—10·9	—15·1	—19·1
7 30	+ 3·7	+ 4·3	+ 4·5	+ 3·5	+ 0·5	0	— 3·4	—13·5	—16·0	—14·7
8 30	+ 1·5	+ 1·8	+ 3·9	0·0	+ 2·9	0	— 1·6	— 8·5	—17·0	— 2·6
9 30	+ 1·3	— 2·5	+ 1·2	+ 2·3	— 0·5	0	+ 0·3	— 6·8	—14·0	— 1·5
10 30	+ 1·6	— 2·5	+ 0·5	+ 0·5	+ 2·1	0	— 1·3	— 7·4	—11·1	— 2·4
11 30	— 0·3	+ 1·8	— 0·3	+ 1·0	+ 1·3	0	— 0·8	— 8·3	— 9·1	— 4·6
		3° S. Dec.	6° S. Dec.	9° S. Dec.	12° S. Dec.	15° S. Dec.	18° S. Dec.	21° S. Dec.	24° S. Dec.	27° S. Dec.
30		+ 2·9	+ 4·9	+ 3·2	+ 0·9	0	— 3·1	— 0·1	+ 1·1	— 8·9
1 30		+ 3·7	+ 5·7	+ 3·7	+ 1·8	0	— 3·4	— 0·4	— 2·4	—10·0
2 30		+ 5·1	+ 5·1	+ 4·3	+ 2·0	0	— 2·9	— 3·8	— 4·4	—10·9
3 30		+ 7·5	+ 7·5	+ 3·9	+ 2·8	0	+ 2·4	— 4·4	— 6·8	—11·7
4 30		+ 7·9	+ 5·9	+ 6·3	+ 3·6	0	— 2·2	— 5·4	— 8·2	—13·8
5 30		+ 9·6	+ 7·9	+ 6·9	+ 3·9	0	— 6·3	— 7·1	—12·5	—16·9
6 30		+11·1	+ 8·8	+ 6·3	+ 2·0	0	— 7·4	— 7·3	—10·6	—20·0
7 30		+11·0	+ 6·5	+ 6·7	+ 1·7	0	— 6·8	—12·0	— 1·9	—20·1
8 30		+ 0·5	+ 7·2	+ 3·5	+ 2·6	0	— 4·1	+ 4·7	+ 3·9	—10·2
9 30		+ 6·6	+ 6·6	+ 4·4	+ 1·3	0	— 5·1	+ 1·0	+ 4·9	— 7·8
10 30		— 0·7	+ 2·6	+ 3·6	+ 3·0	0	— 3·3	+ 2·8	+ 4·5	— 7·1
11 30		+ 5·1	+ 2·4	+ 3·4	+ 2·4	0	— 3·0	+ 2·8	+ 0·6	— 9·5

Table XIV.

Showing the Difference in the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to fifteen de grees Declination, for every three degrees of her Declination north *or* south.

Moon's Transit.	0	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.
h m	m	m	m	m	m	m	m	m	m	m
30	+ 4·8	+ 2·1	+ 2·8	+ 2·2	+ 0·6	0	— 1·6	— 3·8	— 5·1	— 8·1
1 30	+ 3·8	+ 3·5	+ 4·5	+ 3·1	+ 1·7	0	— 2·2	— 3·2	— 6·0	— 8·9
2 30	+ 5·4	+ 4·6	+ 4·8	+ 3·3	+ 2·0	0	— 2·4	— 5·6	— 7·8	—11·0
3 30	+ 6·3	+ 6·3	+ 5·8	+ 6·1	+ 2·6	0	+ 0·4	— 4·6	— 8·2	—10·9
4 30	+ 7·3	+ 5·5	+ 6·1	+ 5·8	+ 3·0	0	— 2·7	— 6·4	— 9·9	—14·4
5 30	+ 8·4	+ 8·9	+ 8·0	+ 6·0	+ 2·1	0	— 5·9	— 8·4	—12·8	—17·1
6 30	+11·3	+10·4	+ 8·3	+ 6·3	+ 2·8	0	— 5·1	— 9·1	—12·8	—19·5
7 30	+ 5·5	+ 7·1	+ 4·9	+ 4·5	+ 0·5	0	— 5·7	—13·3	— 9·6	—18·0
8 30	+ 4·2	+ 1·1	+ 5·5	+ 1·8	+ 2·7	0	— 2·8	— 2·0	— 6·6	— 6·4
9 30	+ 3·7	+ 2·1	+ 3·9	+ 3·4	+ 0·5	0	— 2·4	— 2·9	— 4·5	— 4·6
10 30	+ 3·7	— 1·6	+ 1·6	+ 2·0	+ 2·5	0	— 2·3	— 2·3	— 1·0	— 5·2
11 30	+ 2·3	+ 3·5	+ 1·1	+ 2·2	+ 1·9	0	— 1·9	— 2·7	— 4·2	— 7·0

Table XV. (Interpolated from Table X.)

Showing the Height of High Water at the Liverpool Docks for every three degrees of the Moon's Declination north *and* south.

Moon's Transit.	0° Dec.	3° N. Dec.	6° N. Dec.	9° N. Dec.	12° N. Dec.	15° N. Dec.	18° N. Dec.	21° N. Dec.	24° N. Dec.	27° N. Dec.	Mean.
h m	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
30	18·33	18·30	18·14	18·09	18·00	17·79	17·08	17·80	17·43	16·34	17·73
1 30	18·27	18·31	18·49	18·17	17·86	17·63	17·17	17·44	17·72	16·11	17·72
2 30	17·49	17·90	17·71	17·40	17·39	16·89	16·72	17·16	17·38	15·97	17·20
3 30	16·75	16·38	16·40	16·38	16·04	16·10	15·91	16·14	16·44	15·10	16·14
4 30	15·04	15·17	15·05	14·94	14·87	14·64	14·39	14·91	15·04	13·70	14·77
5 30	14·12	13·61	13·78	13·77	13·53	13·15	12·80	13·37	13·45	12·37	13·40
6 30	13·08	13·13	12·69	12·68	12·38	12·27	11·87	12·21	12·16	10·75	12·32
7 30	12·91	13·24	13·19	12·71	12·56	12·13	12·00	12·19	11·97	10·82	12·97
8 30	14·13	13·86	13·48	14·11	13·63	13·33	13·01	13·32	13·07	12·12	13·41
9 30	15·14	15·52	15·21	15·11	14·92	14·90	14·67	14·53	14·92	13·69	14·86
10 30	16·86	16·71	16·64	16·49	16·22	16·51	15·95	16·19	15·97	15·02	16·26
11 30	16·83	17·69	17·23	17·56	17·25	17·07	16·81	17·00	16·75	15·52	16·97
		3° S. Dec.	6° S. Dec.	9° S. Dec.	12° S. Dec.	15° S. Dec.	18° S. Dec.	21° S. Dec.	24° S. Dec.	27° S. Dec.	
30		18·54	18·00	18·40	18·38	18·19	17·93	17·10	16·41	17·21	17·80
1 30		18·28	18·50	18·41	18·44	18·21	18·20	17·04	16·45	17·46	17·89
2 30		17·60	17·73	17·68	17·67	17·54	17·80	16·41	16·08	16·99	17·03
3 30		16·55	16·68	16·81	16·64	16·40	16·74	15·80	15·45	16·09	16·35
4 30		15·43	15·43	15·20	15·13	15·14	14·87	14·39	13·99	14·64	14·91
5 30		13·75	14·06	13·76	13·89	14·06	13·64	12·74	12·53	13·20	13·51
6 30		12·94	12·86	13·03	12·55	12·64	12·83	11·43	11·22	11·54	12·34
7 30		13·00	12·95	12·54	12·62	12·65	12·65	11·63	11·31	11·57	12·33
8 30		13·13	13·85	13·88	13·67	13·51	13·64	12·62	12·56	12·90	13·31
9 30		15·31	15·48	15·69	15·11	15·09	15·18	14·51	14·14	14·30	14·96
10 30		16·69	16·95	16·63	16·75	16·56	16·49	15·67	15·12	15·45	16·26
11 30		17·73	18·00	18·15	17·58	17·37	17·45	16·57	16·30	16·46	17·29

Table XVI.

Showing the Height of High Water at the Liverpool Docks for every three degrees of the Moon's Declination north *or* south.

Moon's Transit.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.	Mean.
h m	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
30	18·33	18·42	18·07	18·24	18·19	17·99	17·50	17·45	16·92	16·77	17·79
1 30	18·27	18·30	18·50	18·29	18·15	17·92	17·69	17·24	17·08	16·79	17·82
2 30	17·49	17·75	17·72	17·54	17·53	17·22	17·26	16·78	16·73	16·49	17·25
3 30	16·75	16·47	16·54	16·60	16·34	16·25	16·33	15·97	15·95	15·60	16·28
4 30	15·04	15·30	15·24	14·98	15·00	14·89	14·53	14·65	14·52	14·17	14·83
5 30	14·12	13·68	13·92	13·76	13·71	13·60	13·22	13·06	12·99	12·78	13·48
6 30	13·08	13·04	12·77	12·86	12·46	12·45	12·35	11·80	11·69	11·15	12·36
7 30	12·91	13·12	13·07	12·62	12·59	12·39	12·32	11·91	11·64	11·19	12·38
8 30	14·13	13·50	13·66	14·00	13·65	13·42	13·33	12·97	12·80	12·51	13·40
9 30	15·14	15·41	15·35	15·40	15·01	15·00	14·93	14·52	14·53	14·00	14·93
10 30	16·86	16·70	16·80	16·56	16·49	16·53	16·22	15·93	15·54	15·24	16·29
11 30	16·83	17·71	17·61	17·86	17·41	17·22	17·13	16·79	16·52	15·99	17·71

Table XVII.

Showing the Difference between the Height of High Water and the Height corresponding to fifteen degrees of the Moon's Declination, for every three degrees of her Declination north *and* south.

Moon's Transit.	0° Dec.	3° N. Dec.	6° N. Dec.	9° N. Dec.	12° N. Dec.	15° N. Dec.	18° N. Dec.	21° N. Dec.	24° N. Dec.	27° N. Dec.
h m	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
30	+·54	+ ·51	+·35	+·30	+·21	0	—·71	+·09	—·36	—1·45
1 30	+·64	+ ·68	+·86	+·54	+·23	0	—·46	—·19	+·09	—1·52
2 30	+·60	+1·01	+·82	+·51	+·50	0	—·17	+·27	+·49	— ·92
3 30	+·65	+ ·28	+·30	+·28	—·06	0	—·19	+·04	+·34	—1·00
4 30	+·40	+ ·53	+·41	+·30	+·23	0	—·25	+·27	+·40	— ·94
5 30	+·97	+ ·46	+·63	+·62	+·38	0	—·35	+·22	+·22	— ·78
6 30	+·81	+ ·86	+·42	+·41	+·11	0	—·40	—·06	—·11	—2·52
7 30	+·78	+ ·11	+·06	+·58	+·47	0	—·13	+·06	—·16	—1·31
8 30	+·80	+ ·53	—·15	+·78	+·30	0	—·32	—·01	—·26	—1·21
9 30	+·24	+ ·62	+·31	+·21	+·02	0	—·23	—·37	+·02	—1·21
10 30	+·35	+ ·20	+·13	—·02	—·29	0	—·56	—·32	—·54	—1·49
11 30	—·24	+ ·62	—·02	+·49	+·18	0	—·26	—·07	—·32	—1·29
		3° S. Dec.	6° S. Dec.	9° S. Dec.	12° S. Dec.	15° S. Dec.	18° S. Dec.	21° S. Dec.	24° S. Dec.	27° S. Dec.
30		+·35	—·19	+·21	+·19	0	—·26	—1·09	—1·78	— ·98
1 30		+·07	—·16	+·20	+·23	0	—·01	—1·17	—1·76	— ·75
2 30		+·06	+·19	+·14	+·13	0	+·26	—1·13	—1·46	— ·55
3 30		+·15	+·28	+·41	+·24	0	+·34	— ·60	— ·90	— ·31
4 30		+·29	+·29	+·06	—·01	0	—·27	— ·75	—1·15	— ·50
5 30		—·31	00	—·30	—·17	0	—·42	—2·32	—1·53	— ·86
6 30		+·30	+·22	+·39	—·10	0	+·19	—1·21	—1·42	—1·10
7 30		+·35	+·30	—·11	—·03	0	00	—1·02	—1·34	—1·08
8 30		—·38	+·34	+·37	+·16	0	+·13	— ·89	— ·95	— ·61
9 30		+·22	+·30	+·60	+·02	0	+·09	— ·60	— ·95	— ·79
10 30		+·13	+·39	+·07	+·19	0	—·07	— ·89	—1·44	—1·11
11 30		+·36	+·63	+·78	+·21	0	+·08	— ·80	—1·07	— ·99

Table XVIII.

Showing the Difference between the Height of High Water and the Height corresponding to fifteen degrees of the Moon's Declination, for every three degrees of her Declination north *or* south.

Moon's Transit.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.
h m	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
30	+·44	+·43	+·08	+·25	+·20	0	—·49	—·54	—1·07	—1·22
1 30	+·35	+·38	+·58	+·37	+·23	0	—·23	—·68	— ·84	—1·13
2 30	+·27	+·53	+·50	+·32	+·31	0	+·04	—·44	— ·49	— ·73
3 30	+·50	+·22	+·29	+·35	+·09	0	+·08	—·28	— ·30	— ·65
4 30	+·15	+·41	+·35	+·09	+·11	0	—·36	—·24	— ·37	— ·72
5 30	+·52	+·08	+·32	+·16	+·11	0	—·38	—·54	— ·61	— ·82
6 30	+·63	+·59	+·32	+·41	+·01	0	—·10	—·65	— ·76	—1·30
7 30	+·52	+·73	+·68	+·23	+·20	0	—·07	—·48	— ·75	—1·20
8 30	+·71	+·08	+·24	+·58	+·23	0	—·09	—·45	— ·62	— ·91
9 30	+·14	+·41	+·35	+·40	+·01	0	—·07	—·48	— ·47	—1·00
10 30	+·33	+·17	+·23	+·03	—·04	0	—·31	—·60	— ·99	—1·29
11 30	—·39	+·49	+·39	+·64	+·19	0	—·09	—·43	— ·70	—1·23

Table IV. has been formed on the supposition that Mr. HUTCHINSON'S *clock was regulated according to Apparent Solar Time. The following*

TABLE XIX.

Results from Table I., if Mr. HUTCHINSON'S clock was regulated according to Mean Solar Time, showing the Difference in the Interval between the Mean Solar Time of the Moon's Transit and the Time of High Water, and the Mean Interval, for every month in the year.

Moon's Transit.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
h m	m	m	m	m	m	m	m	m	m	m	m	m
30	−13·3	−13·7	− 6·5	+2·8	+ 3·9	− 3·2	− 8·5	− 3·4	+8·5	+16·7	+16·2	0·0
1 30	−11·2	− 7·3	− 5·6	+0·7	+ 1·6	− 4·8	− 7·7	+ 0·3	+7·3	+15·6	+12·9	− 1·6
2 30	− 7·7	−10·1	− 4·5	−1·1	− 2·2	− 4·7	− 4·3	+ 3·3	+9·2	+12·4	+ 9·5	+ 0·3
3 30	− 4·5	− 9·2	− 7·6	−1·4	− 2·5	− 2·0	+ 0·8	− 0·1	+8·3	+ 9·3	+ 7·6	+ 1·2
4 30	− 1·3	−10·2	−11·2	−8·5	− 2·5	+ 2·4	+ 5·6	+ 3·7	+3·8	+ 6·1	+ 7·2	+ 5·4
5 30	+ 1·2	−11·5	−15·5	−9·8	+ 0·1	+ 8·8	+ 6·5	+ 2·0	−0·8	+ 3·5	+ 9·6	+12·0
6 30	− 1·4	−17·8	−19·1	−8·7	+ 5·0	+12·2	+ 5·9	− 6·3	−3·5	+ 2·8	+14·8	+16·4
7 30	− 8·0	−21·0	−17·4	+0·2	+10·3	+10·4	− 7·0	−10·1	−4·1	+11·5	+22·0	+13·7
8 30	−14·0	−19·5	− 9·8	+1·8	+ 8·8	+ 1·9	− 7·9	− 8·7	+2·2	+17·9	+20·5	+ 7·4
9 30	−15·5	−14·5	− 9·0	+3·6	+ 6·0	− 1·5	− 7·1	− 7·6	+4·9	+17·5	+18·2	+ 1·7
10 30	−15·7	−15·3	− 8·3	+4·2	+ 6·7	− 2·3	− 9·6	− 5·8	+7·2	+18·8	+17·7	+ 2·4
11 30	− 7·6	−15·2	− 7·2	+4·4	+ 3·5	− 3·0	−10·0	− 5·6	+8·1	+17·6	+16·0	− 0·1

Table XIII. has been formed upon the supposition that Mr. HUTCHINSON'S *clock was regulated according to Apparent Solar Time. The following*

TABLE XX.

Results from Table X., if Mr. HUTCHINSON'S clock was regulated according to Mean Solar Time, showing the Difference in the Interval between the Mean Solar Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to fifteen degrees Declination, for every three degrees of her Declination north *and* south.

Moon's Transit.	0	3° N. Dec.	6° N. Dec.	9° N. Dec.	12° N. Dec.	15° N. Dec.	18° N. Dec.	21° N. Dec.	24° N. Dec.	27° N. Dec.
h m	m	m	m	m	m	m	m	m	m	m
30	+ 0·5	− 0·9	− 0·8	− 0·1	− 0·8	0	+ 0·3	− 5·7	−10·0	− 4·3
1 30	− 3·5	− 3·1	− 3·3	− 1·9	− 0·8	0	+ 1·9	− 2·4	− 5·1	− 2·1
2 30	− 3·3	− 2·5	− 1·7	− 2·1	− 0·1	0	+ 3·8	− 1·8	− 3·0	− 1·8
3 30	− 2·4	− 3·2	− 2·0	− 1·6	− 1·3	0	+ 2·3	− 0·4	− 3·3	− 2·4
4 30	+ 0·6	− 2·9	+ 0·8	+ 1·2	+ 0·6	0	− 0·5	− 4·6	− 5·9	− 9·0
5 30	+ 5·6	+ 6·6	+ 6·9	+ 4·9	0	0	− 3·0	− 5·3	−11·6	−14·7
6 30	+12·5	+ 7·4	+10·5	+ 7·7	+ 4·7	0	− 3·8	−11·7	−16·3	−21·0
7 30	+ 8·5	+ 9·9	+ 8·7	+ 6·8	+ 1·3	0	− 7·1	−10·8	−21·2	−20·9
8 30	+10·3	+ 9·4	+10·8	+ 6·3	+ 6·8	0	− 5·1	−13·1	−20·3	−11·4
9 30	+10·2	+ 6·0	+ 8·5	+ 8·1	+ 2·0	0	− 4·3	−10·9	−21·6	− 9·5
10 30	+ 7·3	+ 3·1	+ 4·9	+ 4·2	+ 3·9	0	− 4·0	−11·8	−16·2	−10·2
11 30	+ 1·9	+ 4·3	+ 1·4	+ 2·1	+ 2·7	0	− 2·0	− 9·3	−10·5	− 6·8
		3° S. Dec.	6° S. Dec.	9° S. Dec.	12° S. Dec.	15° S. Dec.	18° S. Dec.	21° S. Dec.	24° S. Dec.	27° S. Dec.
30		− 0·1	+ 2·4	+ 2·0	− 0·5	0	− 2·2	+ 0·7	+ 2·9	− 6·9
1 30		− 4·1	− 0·4	− 1·2	− 1·0	0	− 1·5	+ 3·5	+ 2·1	− 4·7
2 30		− 2·4	− 1·4	− 0·3	− 1·4	0	+ 1·0	+ 2·0	+ 2·4	− 3·8
3 30		− 0·4	− 1·5	− 1·5	− 0·9	0	+ 6·9	− 0·4	− 0·7	−10·3
4 30		+ 0·8	+ 1·7	+ 1·4	+ 1·2	0	+ 1·7	− 1·3	− 3·9	− 6·4
5 30		+ 7·6	+ 5·1	+ 7·1	+ 2·8	0	− 5·3	− 6·0	−10·3	−14·7
6 30		+10·0	+10·9	+ 7·5	+ 3·9	0	− 8·4	− 8·6	−11·3	−13·5
7 30		+16·7	+10·8	+11·6	+ 4·5	0	−10·6	−15·8	− 6·6	−26·9
8 30		+ 7·8	+13·1	+ 8·1	+ 5·7	0	− 7·8	− ·9	− 3·3	−10·4
9 30		+14·1	+13·0	+ 8·1	+ 3·4	0	−10·6	− 4·6	− 2·3	− 6·9
10 30		+ 5·0	+ 7·9	+ 8·2	+ 4·2	0	− 6·4	− 0·9	− 1·1	−13·5
11 30		+ 9·9	+ 4·5	+ 6·1	+ 3·8	0	+ 3·7	+ 1·8	− 0·6	−12·2

Tables to be used in predicting the Time of High Water at Liverpool.

Table XXI.

Showing the Semimenstrual Inequality + a constant, or the Interval between the Moon's Transit and the Time of High Water, her Parallax being 57′, and her Declination 15°. (This Table has been formed by interpolation from the column corresponding to Parallax 57′ in Table VII.)

Moon's Transit.	Interval.	Moon's Transit.	Interval.	Moon's Transit.	Interval.	Moon's Transit.	Interval.	Moon's Transit.	Interval.
h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
0 0	11 25	2 30	10 45	5 0	10 23	7 30	11 16	10 0	11 50
0 10	11 23	2 40	10 43	5 10	10 23	7 40	11 20	10 10	11 49
0 20	11 21	2 50	10 41	5 20	10 23	7 50	11 25	10 20	11 48
0 30	11 18	3 0	10 39	5 30	10 23	8 0	11 30	10 30	11 47
0 40	11 16	3 10	10 37	5 40	10 24	8 10	11 34	10 40	11 44
0 50	11 13	3 20	10 35	5 50	10 26	8 20	11 39	10 50	11 41
1 0	11 10	3 30	10 33	6 0	10 28	8 30	11 44	11 0	11 39
1 10	11 8	3 40	10 32	6 10	10 32	8 40	11 46	11 10	11 37
1 20	11 5	3 50	10 31	6 20	10 36	8 50	11 48	11 20	11 35
1 30	11 2	4 0	10 30	6 30	10 40	9 0	11 50	11 30	11 32
1 40	11 0	4 10	10 28	6 40	10 46	9 10	11 51	11 40	11 30
1 50	10 57	4 20	10 26	6 50	10 52	9 20	11 51	11 50	11 28
2 0	10 54	4 30	10 25	7 0	10 58	9 30	11 52		
2 10	10 51	4 40	10 24	7 10	11 4	9 40	11 52		
2 20	10 48	4 50	10 24	7 20	11 10	9 50	11 51		

Table XXII.

Showing the Semimenstrual Inequality + a constant, or the Height of High Water at Liverpool, the Moon's Parallax being 57′, and her Declination 15°, from the Sill of the Old Dock Gates.

Moon's Transit.	Height of High Water.	Moon's Transit.	Height of High Water.	Moon's Transit.	Height of High Water.	Moon's Transit.	Height of High Water.	Moon's Transit.	Height of High Water.
h m	feet.	h m	feet.	h m	feet.	h m	feet.	h m	feet.
0 0	17·25	2 30	17·04	5 0	14·12	7 30	12·33	10 0	15·40
0 10	17·35	2 40	16·90	5 10	13·90	7 40	12·40	10 10	15·60
0 20	17·45	2 50	16·75	5 20	13·65	7 50	12·55	10 20	15·80
0 30	17·53	3 0	16·60	5 30	13·39	8 0	12·70	10 30	16·00
0 40	17·55	3 10	16·45	5 40	13·21	8 10	12·90	10 40	16·20
0 50	17·57	3 20	16·30	5 50	13·05	8 20	13·10	10 50	16·35
1 0	17·59	3 30	16·17	6 0	12·90	8 30	13·36	11 0	16·50
1 10	17·61	3 40	15·95	6 10	12·77	8 40	13·60	11 10	16·68
1 20	17·62	3 50	15·73	6 20	12·65	8 50	13·80	11 20	16·85
1 30	17·63	4 0	15·51	6 30	12·53	9 0	14·10	11 30	17·00
1 40	17·59	4 10	15·30	6 40	12·44	9 10	14·30	11 40	17·10
1 50	17·50	4 20	15·10	6 50	12·40	9 20	14·55	11 50	17·20
2 0	17·40	4 30	14·89	7 0	12·37	9 30	14·79		
2 10	17·30	4 40	14·60	7 10	12·34	9 40	15·00		
2 20	17·17	4 50	14·37	7 20	12·32	9 50	15·20		

The two following Tables have been made by arbitrary alterations in Tables VIII. and XI., in order to get rid of the irregularities, and may, I think, be considered as showing the effect of changes in the Moon's parallax upon the tides at Liverpool.

Table XXIII.

Showing the Correction for the Moon's Parallax in the Time of High Water at Liverpool.

Moon's Transit.	H. P. 54′.	H. P. 55′.	H. P. 56′.	H. P. 57′.	H. P. 58′.	H. P. 59′.	H. P. 60′.
m	m	m	m	m	m	m	m
0	+ 8	+ 5	+ 2	0	− 2	− 5	− 8
1	+ 7	+ 4	+ 2	0	− 2	− 4	− 7
2	+ 5	+ 3	+ 1	0	− 1	− 3	− 5
3	+ 3	+ 2	+ 1	0	− 1	− 2	− 3
4	+ 2	+ 1	+ 0	0	0	− 1	− 2
5	+ 2	+ 1	+ 0	0	0	− 1	− 2
6	+ 4	+ 2	+ 1	0	− 1	− 2	− 4
7	+ 10	+ 6	+ 3	0	− 3	− 6	− 10
8	+ 15	+ 10	+ 5	0	− 5	− 10	− 15
9	+ 15	+ 10	+ 5	0	− 5	− 10	− 15
10	+ 12	+ 8	+ 4	0	− 4	− 8	− 12
11	+ 10	+ 6	+ 3	0	− 3	− 6	− 10

Table XXIV.

Showing the Correction for the Moon's Parallax in the Height of High Water at Liverpool.

Moon's Transit.	H. P. 54′.	H. P. 55′.	H. P. 56′.	H. P. 57′.	H. P. 58′.	H. P. 59′.	H. P. 60′.
h	feet.	feet.	feet.	feet.	feet.	feet.	feet.
0	−1·15	− ·76	−·38	0	+·38	+ ·76	+1·15
1	−1·25	− ·82	−·41	0	+·41	+ ·82	+1·25
2	−1·40	− ·92	−·46	0	+·46	+ ·92	+1·40
3	−1·50	−1·00	−·50	0	+·50	+1·00	+1·50
4	−1·50	−1·00	−·50	0	+·50	+1·00	+1·50
5	−1·50	−1·00	−·50	0	+·50	+1·00	+1·50
6	−1·50	−1·00	−·50	0	+·50	+1·00	+1·50
7	−1·45	− ·98	−·48	0	+·48	+ ·96	+1·45
8	−1·35	− ·90	−·45	0	+·45	+ ·90	+1·35
9	−1·30	− ·86	−·43	0	+·43	+ ·86	+1·30
10	−1·25	− ·82	−·41	0	+·41	+ ·82	+1·25
11	−1·20	− ·80	−·40	0	+·40	+ ·80	+1·20

The following Table has been formed from Table XIV.

Table XXV.

Showing the Correction for the Moon's Declination in the Time of High Water at Liverpool, *if Mr.* Hutchinson's *Clock was regulated according to Apparent Solar Time.*

Moon's Transit.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	27° Dec.
h	m	m	m	m	m	m	m	m	m	m
0	+ 4	+ 3	+ 2	+ 1	+ 1	0	− 1	− 3	− 5	− 7
1	+ 5	+ 4	+ 2	+ 2	+ 1	0	− 2	− 4	− 6	− 8
2	+ 6	+ 4	+ 3	+ 2	+ 1	0	− 2	− 4	− 6	− 9
3	+ 7	+ 5	+ 3	+ 2	+ 1	0	− 2	− 4	− 7	−10
4	+ 9	+ 7	+ 5	+ 3	+ 1	0	− 3	− 6	− 9	−13
5	+11	+ 8	+ 6	+ 4	+ 2	0	− 4	− 8	−12	−16
6	+13	+10	+ 7	+ 4	+ 2	0	− 4	− 8	−13	−18
7	+ 9	+ 7	+ 5	+ 3	+ 1	0	− 4	− 8	−13	−18
8	+ 6	+ 4	+ 3	+ 2	+ 1	0	− 4	− 8	−12	−17
9	+ 4	+ 3	+ 2	+ 1	+ 1	0	− 1	− 3	− 5	− 7
10	+ 3	+ 2	+ 1	+ 1	+ 1	0	− 1	− 2	− 3	− 4
11	+ 3	+ 2	+ 1	+ 1	+ 1	0	− 1	− 2	− 3	− 4

The following Table has been formed from Table XVIII. Although it would seem from Table XVII. that a difference does exist in the correction for north and south declination, yet the numbers in the latter Table are so irregular as almost to defy any attempt to reduce them to uniformity.

Table XXVI.

Showing the Correction for the Moon's Declination in the Height of High Water at Liverpool.

Moon's Transit.	0° Dec.	3° Dec.	6° Dec.	9° Dec.	12° Dec.	15° Dec.	18° Dec.	21° Dec.	24° Dec.	29° Dec.
h	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
0	+·40	+·32	+·24	+·16	+·08	0	−·25	−·50	−·75	−1·00
1	+·55	+·44	+·33	+·22	+·11	0	−·25	−·50	−·75	−1·00
2	+·64	+·52	+·39	+·26	+·13	0	−·19	−·37	−·56	− ·75
3	+·60	+·48	+·36	+·24	+·12	0	−·12	−·25	−·37	− ·50
4	+·40	+·32	+·24	+·16	+·08	0	−·10	−·20	−·30	− ·40
5	+·38	+·29	+·21	+·14	+·07	0	−·16	−·32	−·48	− ·65
6	+·50	+·40	+·30	+·20	+·10	0	−·21	−·42	−·63	− ·85
7	+·70	+·56	+·42	+·28	+·14	0	−·22	−·44	−·66	− ·90
8	+·60	+·48	+·36	+·24	+·12	0	−·20	−·40	−·60	− ·80
9	+·50	+·40	+·30	+·20	+·10	0	−·14	−·28	−·42	− ·55
10	+·40	+·32	+·24	+·16	+·08	0	−·14	−·28	−·42	− ·55
11	+·30	+·24	+·18	+·12	+·06	0	−·17	−·34	−·51	− ·70

Index to the Tables formed from Mr. HUTCHINSON'S *Observations.*

In forming these Tables it has been assumed that the Observations were recorded in Apparent Solar Time. The Time of the Moon's Transit at Greenwich, which constitutes the principal argument of the Tables, is always given in Apparent Solar Time.

Table I., showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Height of High Water at the Liverpool Old Docks (as recorded by Mr. HUTCHINSON), corresponding to the Apparent Solar Time of the Moon's Transit, in each month of the year. (If Mr. HUTCHINSON's clock was regulated according to *mean* solar time, the interval must be *diminished* by the equation of time given at foot of each month.)

Table II. (Interpolated from Table I.), showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water at Liverpool Old Docks, for each month in the year.

Table III. (Interpolated from Table I.), showing the Height of High Water at Liverpool Old Docks, corresponding to the Apparent Solar Time of the Moon's Transit, in each month of the year.

Table IV., showing the Difference in the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Mean Interval, for every month in the year.

Table V., showing the Difference in the Height of High Water and the Mean Height for every month in the year.

Table VI., showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Height of High Water at the Liverpool Old Docks, corresponding to the Apparent Solar Time of the Moon's Transit, for every minute of her Horizontal Parallax.

Table VII. (Interpolated from Table VI.)

Table VIII., showing the Difference in the Interval between the Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to fifty-seven minutes of the Moon's Horizontal Parallax.

Table IX., showing the Difference between the Height of High Water and the Height corresponding to fifty-seven minutes of the Moon's Horizontal Parallax.

Table X., showing the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Height of High Water at the Liverpool Old Docks, corresponding to the Apparent Solar Time of the Moon's Transit, for every three degrees of her Declination north and south. The Equation of Time to be added to Apparent Time. (In forming this Table, it has been assumed that Mr. HUTCHINSON's clock was regulated according to *apparent* solar time; if it was regulated according to *mean* solar time, the interval must be *diminished* by the equation of time given in the third column.)

Table XI. (Interpolated from Table X.), showing the Interval between the Apparent Time of the Moon's Transit and the Time of High Water at the Liverpool Old Docks for every three degrees of her Declination north *and* south.

Table XII., showing the Interval between the Apparent Time of the Moon's Transit and the Time of High Water at the Liverpool Old Docks for every three degrees of her Declination north *or* south.

Table XIII., showing the Difference in the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to 15° Declination, for every three degrees of her Declination north *and* south.

Table XIV., showing the Difference in the Interval between the Apparent Solar Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to 15° Declination, for every three degrees of her Declination north *or* south.

Table XV. (Interpolated from Table X.), showing the Height of High Water at the Liverpool Docks for every three degrees of the Moon's Declination north *and* south.

Table XVI., showing the Height of High Water at the Liverpool Docks for every three degrees of the Moon's Declination north *or* south.

Table XVII., showing the Difference between the Height of High Water and the Height corresponding to fifteen degrees of the Moon's Declination, for every three degrees of her Declination north *and* south.

Table XVIII., showing the Difference between the Height of High Water and the Height corresponding to fifteen degrees of the Moon's Declination, for every three degrees of her Declination north *or* south.

Table XIX. results from Table I., if Mr. HUTCHINSON's Clock was regulated according to Mean Solar Time, showing the Difference in the Interval between the Mean Solar Time of the Moon's Transit and the Time of High Water, and the Mean Interval, for every month in the year.

Table XX. results from Table X., if Mr. HUTCHINSON's Clock was regulated according to Mean Solar Time, showing the Difference in the Interval between the Mean Solar Time of the Moon's Transit and the Time of High Water, and the Interval corresponding to 15° Declination, for every three degrees of her Declination north *and* south.

Table XXI., showing the Semimenstrual Inequality + a constant, or the Interval between the Moon's Transit and the Time of High Water, her Parallax being 57′, and her Declination 15°. (This Table has been formed by interpolation from the column corresponding to Parallax 57′ in Table VII.)

Table XXII., showing the Semimenstrual Inequality + a constant, or the Height of High Water at Liverpool, the Moon's Parallax being 57′, and her Declination 15°, from the Sill of the Old Dock Gates.

Table XXIII., showing the correction for the Moon's Parallax in the Time of High Water at Liverpool.

Table XXIV., showing the Correction for the Moon's Parallax in the Height of High Water at Liverpool.

Table XXV., showing the Correction for the Moon's Declination in the Time of High Water at Liverpool, *if Mr.* HUTCHINSON'S *Clock was regulated according to Apparent Solar Time.*

Table XXVI., showing the Correction for the Moon's Declination in the Height of High Water at Liverpool.